4.0 DATA COLLECTION ACTIVITIES

4.1 Introduction

As part of the development of the Landfills effluent guideline, EPA collected data from a variety of different sources. These sources included existing data from previous EPA and other governmental data collection efforts, industry-provided information, new data collected from questionnaire surveys, and field sampling data. This chapter discusses each of these data sources, as well as EPA's quality assurance/quality control (QA/QC) efforts and data editing procedures. Chapters 5 through 11 present summaries and analyses of the data collected by EPA.

4.2 Preliminary Data Summary

EPA's initial effort to develop effluent limitations guidelines and pretreatment standards for the waste treatment industry began in 1986. EPA conducted a study of the hazardous waste treatment industry in which it determined the scope of the industry, the operations performed, the type of wastewater generated, and types of discharges. For this study, EPA looked at a hazardous waste treatment industry that included landfills with leachate collection and treatment facilities, incinerators with wet scrubbers, and aqueous hazardous waste treatment facilities. This study characterized the wastewater generated by facilities in the industry and the wastewater treatment technologies used to treat this wastewater. In addition, the study included industry profiles, the cost of wastewater control and treatment, and environmental assessments. EPA published the results of this study in a report entitled "Preliminary Data Summary for the Hazardous Waste Treatment Industry" (EPA 440/1-89-100), in September, 1989.

The Agency used data from the following sources in developing the preliminary data summary:

- EPA Office of Research and Development databases (includes field sampling data from 13 hazardous waste landfills in 1985).
- State Agencies (includes a Wisconsin sampling program of 20 municipal landfills in 1983).

- EPA Office of Emergency and Remedial Response Contract Laboratory Program (CLP) Statistical Database, “Most Commonly Occurring Analytes in 56 Leachate Samples.” 1980-83 data.

- National Enforcement Investigations Center (NEIC) sampling program conducted for the Hazardous Waste Groundwater Task Force during 1985.

- EPA sampling at 6 landfill facilities (1986-1987).

- Subtitle D leachate data for miscellaneous Subtitle D landfills, compiled by the EPA Office of Solid Waste.

The EPA Preliminary Data Summary identified 911 landfills that generate leachate. Of these, 173 discharged their leachate directly to surface waters, while 355 discharged indirectly through publicly owned treatment works (POTWs). The remaining 383 used other methods of leachate disposal. The most common "other" disposal method was contract hauling to a commercial aqueous waste treatment facility. However, some facilities land-applied their leachate (spraying of the leachate over the landfill) or injected it into a deep well for disposal.

The key findings of the EPA Preliminary Data Summary included:

- Some leachates were found to contain high concentrations (e.g., over 100,000 micrograms per liter (µg/l)) of toxic organic compounds.

- Raw leachates were found to contain high concentrations of BOD_5, COD, and TOC.

- Leachate flow rates varied widely due to climatic and geological conditions and landfill size. An average landfill was estimated to have a leachate generation rate of approximately 30,000 gallons per day (gpd).

- As a result of Resource Conservation and Recovery Act (RCRA) regulations, the number of leachate collection systems used at landfills was expected to increase.

- RCRA regulations also would cause solid waste generators to increase their use of commercial landfill facilities.

EPA found that a wide range of biological and physical/chemical treatment technologies were in use by landfills, capable of removing high percentages of conventional, nonconventional, and toxic pollutants. Advanced treatment technologies identified in this study include air stripping, ammonia stripping, activated carbon, and lime precipitation.

After a thorough analysis of the landfill data presented in the Preliminary Data Summary, EPA identified the need to develop an effluent guidelines regulation for the Landfills industry in order to set national guidelines and standards. EPA based its decision to develop effluent limitations guidelines on the Preliminary Data Summary's assessment of the current and future trends in the Landfills industry, its analysis of the concentrations of pollutants in the raw leachate, and the study's discussion on the treatment and control technologies available for effective pollution reduction in landfill leachate.

4.3 Clean Water Act (CWA) Section 308 Questionnaires

A major source of information and data used in developing effluent limitations guidelines and standards consisted of industry responses to detailed technical and economic questionnaires, and the subsequent detailed monitoring questionnaires, distributed by EPA under the authority of Section 308 of the CWA. These questionnaires requested information on each facility's industrial operations, ownership status, solid wastes disposed, treatment processes employed, and wastewater discharge characteristics. EPA first developed a database of various types of landfills in the United States using information collected from the following: 1) State environmental and solid waste departments, 2) other State agencies and contacts, 3) the National Survey of Hazardous Waste Treatment Storage, Disposal and Recycling Facilities respondent list, 4) Environmental Ltd.'s 1991 Directory of Industrial and Hazardous Waste Management Firms, 5) the Resource Conservation and Recovery Act (RCRA) 1992 list of Municipal Landfills, and 6) the Resource Conservation and Recovery Information System (RCRIS) National Oversight Database. Based upon these sources, EPA identified 10,477 landfill facilities in the U.S. in 1992. Of this group, 9,882 were Subtitle D landfills while 595 were Subtitle C landfills.

EPA entered all of these facilities into a database which served as the initial population for EPA to collect industry-provided data. EPA's data collection process involved the following three stages:

- Screener Surveys
- Detailed Technical Questionnaires
- Detailed Monitoring Questionnaires

The following sections discuss each of these data collection activities. A more detailed discussion of the landfills survey population can be found in Appendix A.

4.3.1 Screener Surveys

EPA developed a screener survey to collect data on all of the landfill sites in the U.S. identified by the sources above.

4.3.1.1 Recipient Selection and Mailing

EPA divided the 10,477 facilities into four strata for the purpose of determining the screener survey recipients. The Agency defined these strata as the following:

1. Subtitle C facilities.
2. Subtitle D facilities that are known wastewater generators.
3. Subtitle D facilities in states with less than 100 landfills and are not known to be wastewater generators.
4. Subtitle D facilities in states with more than 100 landfills and are not known to be wastewater generators.

The Agency decided that all of the facilities in strata 1, 2, and 3 would receive the screener survey, while only a random sample of the facilities in stratum 4 would receive the survey. Table 4-1 presents the sample frame, number of facilities sampled, and the number of respondents to receive the screener survey.

Table 4-1: Screener Questionnaire Strata

Screener Stratum (g)	Number in Frame (N_g)	Number Sampled (n_g)	Number of Responses (n'_g)
1	595	595	524
2	134	134	120
3	892	892	722
4	8,856	3,375	2,621
Total	10,477	4,996	3,987

4.3.1.2 Information Collected

Information collected by the screener surveys included the following:

- mailing address.
- landfill type, including types and amount of solid waste disposed and landfill capacity.
- wastewater generation rates as a result of landfill operations, including leachate, gas condensate, and contaminated ground water.
- regulatory classification and ownership status.
- wastewater discharge status.
- wastewater monitoring practices.
- wastewater treatment technology in use.

4.3.1.3 Data Entry, Coding, and Analysis

EPA operated a toll-free help line to assist the screener recipients with filling out the 3-page survey. The Agency responded to several thousand phone calls from facilities over a six week period. The help line answered questions regarding applicability, EPA policy, and economic and technical details.

EPA reviewed all screener surveys returned to the Agency to verify that each respondent completed the critical questions in the survey (e.g., wastewater generation and collection, number and types of landfills, discharge status, and wastewater treatment technology). The screeners were in a bubble-sheet format and were scanned directly into a computer database. Once entered, EPA checked the database for logical inconsistencies and contacted facilities to resolve any inconsistencies.

After the QA process, EPA divided the facilities in the database into the following two groups: 1) facilities that indicated they collected landfill generated wastewater; and 2) those that did not. EPA considered facilities that did not collect landfill generated wastewater to be out of the scope of this regulation and therefore did not investigate these facilities any further.

4.3.1.4 Mailout Results

Of the 4,996 screener questionnaires mailed by EPA, 3,628 responded, and of those, EPA determined that 3,581 were potentially in-scope and complete . The Agency entered these surveys into the screener database. Of these, EPA identified 859 facilities that generate and collect one or more types of landfill generated wastewater.

4.3.2 Detailed Technical Questionnaires

Once EPA analyzed the information from the screener surveys in the database, EPA developed a detailed technical and economic questionnaire to obtain more information from facilities that collect landfill generated wastewater.

4.3.2.1 Recipient Selection and Mailing

EPA used the 859 facilities that generated and collected landfill wastewater from the screener database, plus one pre-test questionnaire facility that was not in the screener database, as the frame for selection of facilities to be sent a Detailed Questionnaire. EPA divided these facilities into the following eight strata:

1. Commercial private, municipal, or government facilities that have wastewater treatment and are direct or indirect dischargers.
2. Commercial private, municipal, or government facilities that have wastewater treatment and are not direct or indirect dischargers.
3. Non-commercial private facilities with wastewater treatment
4. Facilities with no wastewater treatment
5. Commercial facilities that accept PCB wastes
6. Municipal hazardous waste facilities
7. Small businesses with no wastewater treatment
8. Pre-test facilities that were not in the screener population

The Agency decided all facilities in strata 1, 5, 6, 7, and 8 would receive the Detailed Questionnaire. EPA sent the Detailed Questionnaire to a random sample of the facilities in strata 2, 3, and 4.

These selection criteria resulted in a mailing of the Detailed Questionnaire to 252 facilities. Chapter 3, Section 3.2.1 briefly discusses the population analysis (referred to as national estimates) conducted from these questionnaire recipients.

4.3.2.2 Information Collected

The Detailed Questionnaire solicited technical and costing information regarding landfill operations at the

selected facilities. EPA divided the questionnaire into the following four main sections:

- Section A - Facility Identification and Operational Information:

    1. General facility information, including the following: ownership status, landfill type, the number of landfills on site, regulatory status, discharge status, when the landfill began accepting waste, and projected closure date.

    2. Landfill operation, including the following: types of waste accepted at the landfill, the amount of waste accepted, landfill capacity, how the waste was organized in the landfill, landfill caps, and landfill liners.

    3. Wastewater generation from landfill operations, including the following: the types of wastewater generated and the generation rates, and the ultimate disposal of the wastewater generated and collected.

- Section B - Wastewater Treatment:

    1. Description of treatment methods employed by the facility to treat the wastewater identified in Section A. This description includes a discussion of commingled wastewater, wastewater treatment technologies, residual waste disposal, and treatment plant capacities.

- Section C - Wastewater Monitoring Data:

    1. A summary of the monitoring data pertaining to the landfill generated wastewater identified in Section A that were collected in 1992 by the facility, including the following: minimum, maximum, averages, number of observations, and sampling and analytical methods.

- Section D - Detailed Wastewater Treatment Design Information:

    1. Detailed technical design, operation and costing information pertaining to the wastewater treatment technologies identified in Section B.

4.3.2.3 Data Entry, Coding, and Analysis

EPA operated a toll-free help line to assist the questionnaire recipients with filling out the Detailed Questionnaire. EPA responded to over one thousand phone calls from facilities over a three-month period.

While some calls pertained to questions of applicability, most were of a technical nature regarding specific questions in the questionnaire.

Once EPA received the completed questionnaires, the Agency thoroughly reviewed each one for technical accuracy and content. After review, the questionnaire was coded for double-key entry into the questionnaire database. EPA resolved all discrepancies between the two inputted values by referring to the original questionnaire.

EPA followed several QA/QC procedures when developing the questionnaire database, including a manual completeness and accuracy check of a random selection of 20 percent of the questionnaires and a database logic check of each completed questionnaire. These QA/QC procedures helped verify the questionnaires for completeness, resolve any internal consistencies, and identify outliers in the data. EPA checked all outliers for accuracy.

4.3.2.4 Mailout Results

Of the 252 recipients, 220 responded with sufficient technical and economic data to be included in the final EPA Detailed Questionnaire database.

4.4 Detailed Monitoring Questionnaire

In addition to the Detailed Questionnaire, EPA also requested detailed wastewater monitoring information from 27 facilities included in the Detailed Questionnaire database via a Detailed Monitoring Questionnaire.

4.4.1 Recipient Selection and Mailing

EPA selected facilities to receive Detailed Monitoring Questionnaires based upon their responses to the Detailed Questionnaire. EPA reviewed each facility's monitoring summary, discharge permit requirements, and their on-site treatment technologies. From these responses, EPA selected 27 facilities to receive a

Detailed Monitoring Questionnaire which could provide useful information on technology performance, pollutant removals, and wastewater characterization.

4.4.2 Information Collected

EPA requested recipients of the Detailed Monitoring Questionnaire to send analytical data (1992, 1993, and 1994 annual data) on daily equalized influent to their wastewater treatment system, as well as effluent data from the treatment system. The three years of analytical data assisted EPA in calculating the variability factors (discussed in Chapter 11) used in calculating the industry effluent limits. EPA also requested analytical data for intermediate waste treatment points for some facilities. In this manner, EPA was able to obtain performance information across individual treatment units in addition to the entire treatment train.

4.4.3 Data Entry, Coding, and Analysis

EPA conducted a thorough review of each Detailed Monitoring Questionnaire response to ensure that the data provided was representative of the facility's treatment system. EPA collected data from 24 semi-continuous and continuous treatment systems and 2 batch treatment systems. The Agency developed a Detailed Monitoring Questionnaire database which included all monitoring data submitted by the selected facilities.

4.5 Engineering Site Visits

EPA visited 19 facilities, including one facility outside the U.S. The purpose of these visits was to evaluate each facility as a potential week-long sampling candidate to collect treatment performance data. EPA selected these facilities based on the responses to the Detailed Questionnaire and attempted to include facilities from a broad cross section of the industry. EPA visited landfills of various ownership status (municipal, commercial, captive), landfills that accept various waste types (construction and demolition, ash, sludge, industrial, municipal, hazardous), and landfills in different geographic regions of the country. Facilities selected for engineering site visits employed various types of treatment processes, including the

following: equalization, chemical and biological treatment, filtration, air stripping, steam stripping, and membrane separation.

EPA visited each landfill for one day. During the engineering site visit, EPA obtained information on the following:

- the facility and its operations.
- the wastes accepted for treatment and the facility's acceptance criteria.
- the raw wastewater generated and its sources.
- the wastewater treatment on site.
- the location of potential sampling points.
- the site-specific sampling needs (access to facility and sample points, and required sampling safety equipment).

Table 4-2 presents a summary of the types of landfill facilities that EPA included in the engineering site visits.

4.6 Wastewater Characterization Site Visits

While conducting engineering site visits, EPA also collected samples for raw wastewater characterization at 15 landfills. EPA collected grab samples of untreated wastewater at various types of landfills and analyzed for constituents in the wastewater including conventionals, metals, organics, pesticides and herbicides, PCBs, and dioxins and furans. Chapter 6 presents the characterization data obtained by EPA.

Table 4-2 also presents a summary of the type of landfill facilities that EPA included in the characterization site visits and the number of wastewater characterization samples collected.

4.7 EPA Week-Long Sampling Program

To collect wastewater treatment performance data, EPA conducted week-long sampling efforts at six landfills. EPA selected these facilities based on the analysis of the information collected during the engineering site visits. Table 4-3 presents a summary of the types of landfills sampled and treatment technologies evaluated.

EPA prepared a detailed sampling plan for each sampling episode. The Agency collected wastewater samples at influent, intermediate, and effluent sample points throughout the entire on-site wastewater treatment system. Sampling at five of the facilities consisted of 24-hour composite samples for five consecutive days. For the sixth facility, EPA took composites of four completed batches over five days. At all facilities, the Agency collected individual grab samples for oil and grease. Volatile organic grab samples were composited in the laboratory prior to analysis.

EPA analyzed samples using EPA Office of Water approved analytical methods. The following table presents the pollutant group and the analytical method used:

Pollutant Group	Analytical Method
Conventional and Nonconventionals	Standard Methods
Metals	EPA 1620
Organics	EPA 1624, 1625
Herbicides, Pesticides, PCBs	EPA 1656, 1657,1658
Dioxins/Furans	EPA 1613

EPA used influent data to characterize raw wastewater for the industry and develop the list of pollutants of interest (see Chapter 6 for raw wastewater characterization and Chapter 7 for pollutant of interest selection). The Agency used influent, intermediate, and effluent data to evaluate performance of the wastewater treatment systems and develop current discharge concentrations, pollutant loadings, and the

best available treatment (BAT) options for the Landfills industry. EPA used effluent data to calculate long-term averages for each of the regulatory options.

Table 4-4 presents the facilities included in the engineering site visits, the raw wastewater characterization sampling effort, and the week-long sampling effort. Note that facilities utilized only for the engineering site visits do not have sampling episode numbers.

4.8 Other Data Sources

In addition to the original data collected by EPA, the Agency used other data sources to supplement the industry database. Each of these data sources is discussed below.

4.8.1 Industry Supplied Data

EPA requested the Landfills industry to provide relevant information and data. The Agency received leachate and ground water characterization and treatability studies from several facilities, including 25 discharge monitoring report (DMR) data packages. EPA used industry-supplied data to characterize the industry, develop pollutant loadings, and develop effluent limitations.

4.8.2 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)/Superfund Amendments and Reauthorization Act (SARA) Ground Water Data

EPA obtained ground water data from the "CERCLA Site Discharges To POTWs Treatability Manual" (EPA 540/2-90-007), prepared by the Industrial Technology Division of the EPA Office of Water Standards and Regulations for the EPA Office of Emergency and Remedial Response. The Agency used data from this study to supplement the ground water data collected during characterization and week-long sampling events. The purpose of the CERCLA study was to do the following:

- Identify the variety of compounds and concentration ranges present in ground water at CERCLA sites.

- Collect data on the treatability of compounds achieved by various on-site pretreatment systems.

- Evaluate the impact of CERCLA discharges to a receiving POTW.

For the CERCLA study, a total of eighteen CERCLA facilities were sampled. However, EPA only used data from facilities that received ground water contaminated as a result of landfilling activities in its analysis of contaminated ground water at landfill facilities. Based in part on this data and for the reasons discussed in Chapter 2, EPA decided not to include contaminated ground water as a regulated wastewater under this guideline. In addition, for the proposal, EPA combined the data from seven CERCLA facilities with EPA sampling data to help characterize the hazardous subcategory and to develop both the current discharge concentrations and pollutant loadings for facilities in the hazardous subcategory. However, since EPA did not include contaminated ground water as a wastewater subject to this guideline, for the final rule, EPA removed all CERCLA data from the Subtitle C raw wastewater characterization database. The data presented in subsequent chapters for hazardous wastewater characterization do not include CERCLA data.

4.8.3 POTW Study

The primary source of POTW percent removal data was the "Fate of Priority Pollutants in Publicly Owned Treatment Works" (EPA 440/1-82-303), commonly referred to as the "50-POTW Study." The 50-POTW Study presents data on 50 well-operated POTWs with secondary treatment in removing toxic pollutants. At most of these plants, a minimum of 6 days of 24-hour sampling of influent, effluent, and sludge streams was completed. Each sample was analyzed for conventional, selected non-conventional, and priority pollutants. The basic objective of the study was to generate, compile, and report data on the occurrence and fate of the 129 priority toxic pollutants in 50 POTWs. Preliminary evaluations of the data were also conducted. The report presents all of the collected data, results of the preliminary evaluations, and results of the calculations to determine the following: 1) the concentrations of priority pollutants in the

influent to POTWs, 2) the concentrations of priority pollutants discharged from the POTWs, 3) the concentrations of priority pollutants in the effluent from intermediate process streams, and 4) the concentrations of priority pollutants in the POTW sludge streams.

Some of the data collected for evaluating POTW removals in the 50-POTW Study included influent levels of pollutants that were close to the detection limit. EPA eliminated these values to reduce the possibility that low POTW removals might simply reflect low influent concentrations instead of being a true measure of treatment effectiveness. For further discussion on the editing rules EPA applied to the 50-POTW Study for use in the assessment of POTW removal, see Chapter 7, Section 7.7.1.

4.8.4 National Risk Management Research Laboratory Data

EPA's National Risk Management Research Laboratory (NRMRL) developed a treatability database (formerly called the Risk Reduction Engineering Laboratory (RREL) database). This computerized database provides information, by pollutant, on removals obtained by various treatment technologies. The database provides the user with the specific data source and the industry from which the wastewater was generated. EPA used the NRMRL database to augment the POTW database for certain pollutants which the 50-POTW Study did not evaluate. EPA edited the NRMRL data so that only treatment technologies representative of typical POTW secondary treatment operations were used. Additional edits applied by EPA are discussed in detail in Chapter 7, Section 7.7.1.

4.9 QA/QC and Other Data Editing Procedures

This section presents the quality assurance/quality control (QA/QC) procedures and editing rules used to analyze the different analytical data sets described in the previous sections (e.g., industry supplied data, Detailed Questionnaire data, Detailed Monitoring Questionnaire data, EPA field sampling, and analytical data collected by other EPA offices). For a complete discussion of all of the conventions used in calculating effluent limitations see the "Statistical Support Document for Final Effluent Limitations Guidelines and Standards for the Landfills Point Source Category" (EPA-821-B-99-007).

4.9.1 QA/QC Procedures

Each analytical data source received a QA/QC review before being included in the EPA analytical, Detailed Questionnaire, and Detailed Monitoring Questionnaire databases. The specific QA/QC activities completed for each analytical data source are discussed below.

4.9.2 Analytical Database Review

EPA's Sample Control Center (SCC) developed and maintained the analytical database, and provided a number of QA/QC functions. SCC documented the results of the QA/QC procedures in data review narratives. EPA then performed completeness checks to ensure the completeness of the analytical database. Both of these QA/QC activities are discussed below. In addition, the following paragraphs outline the editing procedures and data conventions used to finalize the landfill analytical database, to characterize each industry subcategory, and to develop current discharge information and pollutant loadings.

4.9.2.1 Data Review Narratives

The Sample Control Center performed a QA/QC data review and documented its findings in the data review narrative that accompanied each laboratory data package. The data review narrative identified missing data and any other data discrepancies encountered during the QA/QC review. EPA then checked the narratives against the data and sampling episode traffic reports to make sure SCC did not overlook any data discrepancies.

4.9.2.2 Completeness Checks

EPA performed a data completeness check of the analytical database by cross referencing the list of pollutants requested for analysis with the list of pollutants the laboratory actually analyzed at each sample point. To accomplish this, EPA prepared the following:

- a list of all requested analytical methods and method numbers.
- a list of all pollutants and CAS numbers specified under each requested analytical method.
- a schedule of analyses requested by episode for each sample point.

The purpose of the completeness check was to verify that the laboratory performed all of the analyses requested and that SCC posted the results to the database in a consistent manner. The completeness check resulted in identifying the following:

- any pollutant that was scheduled to be analyzed but was not analyzed.
- pollutants that were analyzed but were not scheduled to be analyzed.
- any pollutant for which the expected number of samples analyzed did not agree with the actual number of samples analyzed.

SCC evaluated and resolved discrepancies by subsequent QA/QC reviews. SCC documented all changes to data in the landfill analytical database in a status report entitled "Status of the Waste Treatment Industry: Landfills Database".

4.9.2.3 Trip Blanks and Equipment Blanks

SCC addressed qualifiers assigned to data as a result of trip blank and equipment blank contamination in the same way that it addressed contamination of lab method blanks, detailed below:

- Sample Results Less than Five Times Blank Results: When the sample result was less than five times the blank result, there were no means by which to ascertain whether the presence of the analyte could have attributed to blank contamination. Therefore, the result was included in the database as non-detect, with a nominal detection limit equal to the dilution-adjusted instrument detection limit.
- Sample Results Greater than Five Times but Less than Ten Times Blank Results: These data were of acceptable quality and were used to represent maximum values.

- Sample Results Greater than Ten Times Blank Results or Analyte not Detected in Sample: The presence of the analyte in the blank did not adversely affect the data in those cases where the sample results were greater than ten times the associated blank results or when the analyte was not detected in associated samples. Such data were acceptable without qualification.

4.9.2.4 Field Duplicates

EPA collected field duplicates during the EPA sampling episodes to help determine the accuracy and consistency of the sampling techniques employed in the field. In the analytical database, EPA represented field duplicate results by the letter "D" preceding the sample point number. The Agency combined duplicate samples that it considered acceptable on a daily basis using the following rules:

- If all duplicates were non-detect values, then the aggregate sample was labeled non-detect (ND), and the value of the aggregate sample was the maximum of the ND values.
- If the maximum detected value was greater than the maximum ND value, then the aggregate sample was labeled NC, and the value of the aggregate sample was the sum of the non-censored (NC) and ND values divided by the total number of duplicates for that independent sample.
- If the maximum NC value was less than or equal to the maximum ND value, then the aggregate sample was labeled ND and the value of the aggregate sample was the maximum of the ND values.
- If all duplicates were NC values, then the aggregate sample was labeled NC and the value of the aggregate sample was the average of the NC values.

In the laboratory, SCC calculated analytical precision by determining the relative percent difference of paired spiked samples. EPA considered data acceptable if the relative percent difference was within the laboratory criteria for analytical precision.

EPA considered duplicate relative percent difference values as acceptable if they were within the laboratory criteria for analytical precision plus or minus 10 percent.

4.9.2.5 Grab Samples

Most data presented in the analytical database represent composite sample results, but other types of results exist due to sampling requirements. Most grab sample results were represented by the letters "A", "B", or "C" following the sample point number in the analytical database for grabs collected on the same day. EPA collected grab samples of this nature only for oil and grease/hexane extractable material and EPA included these samples when calculating average concentrations of pollutants. The Agency averaged grab samples of any kind on a daily basis before using them in data analyses.

4.9.2.6 Non-Detect Data

EPA assigned non-detect data numeric values so that they could be used in the data analyses. In general, non-detect data can be set either at the method detection limit, at the instrument detection limit, at half of the method detection limit, or zero. Detection limits can be standardized (as in the method detection limit) or variable (as in the instrument detection limit or the sample detection limit, which may vary depending on dilution). The instrument detection limit is the lowest possible detection limit: the instrument cannot detect the contaminant below this level. In many cases, the method detection limit is significantly higher than the instrument detection limit.

For the Landfills effluent guideline, EPA defined all non-detect data collected from the EPA sampling episodes as follows: 1) the value used for non-detect data was represented by the detection limit reported in the analytical database, and 2) if the detection limit of the non-detect data was greater than the detected results, the average was calculated using all of the data, but the results were flagged for review on an individual basis. When flagged results were reviewed as a whole, the high detection limits were found to be on the same order of magnitude as the detect values; therefore, all flagged data were included in calculating averages.

4.9.2.7 Bi-Phasic Samples

In one sampling episode for a captive hazardous landfill at an industrial facility, some samples collected became bi-phasic. That is, EPA collected aqueous samples, but from the time that EPA collected the sample to the time EPA analyzed it, the sample formed a solid, organic phase. Therefore, the analyzed sample consisted of an aqueous portion and an organic portion. For these samples, EPA reported analytical results for each phase separately. The Agency calculated consolidated results for the bi-phasic samples by factoring the percent of each phase relative to the total sample volume with the results of each phase and adding the weighted results together. Pollutants were not always detected in both the aqueous and organic phases of a bi-phasic sample. In instances where EPA detected a pollutant in one phase and not in the other phase, the detection limit was set at zero, which removed the non-detect phase from the equation. When both phases were non-detect, EPA used the lowest of the two detection limits as the result.

4.9.2.8 Conversion of Weight/Weight Data

In some cases, EPA analyzed wastewater samples collected in the field as solids due to criteria specified in the analytical method. The Agency reported these results in the database in solids units of ug/kg or ng/kg. EPA converted these results to ug/L and ng/L, respectively, so that they could be used in data analysis.

The landfill analytical database contained a file called "solids" that contained percent solids values for those samples associated with a result that were reported on a weight/weight basis. This percent solids value was necessary to convert results from a weight/weight basis to a weight/volume basis.

The following formula was utilized to convert the "amount" from a weight/weight basis to a weight/volume basis. This formula assumed a density of 1:

$$\text{Amount (weight/weight)} \times [\text{Percent Solids}/100] = \text{Amount (weight/volume)}$$

where,

Amount = The result contained in the "amount" field in the "result" file.

Percent Solids = The percent solids result contained in the "percent" field in the "solids" file.

After conversion, the amount was expressed in weight/volume units as shown below:

Weight/Weight Units	Weight/Volume Units
pg/kg	pg/L
ng/kg	ng/L
ug/kg	ug/L
ug/g	ug/mL
mg/kg	mg/L

4.9.2.9 Average Concentration Data

EPA employed all data conventions discussed above when calculating the average concentration of a group of data. The Agency calculated average concentrations to develop raw waste loads, current discharge concentrations, and percent removal values. To calculate the average concentration of a pollutant at a particular sample point, the following hierarchy was used: 1) all non-detect data was set at the detection limit listed in the database, 2) all weight/weight units were converted to weight/volume units using the percent solids file, 3) all units were then converted to ug/L, 4) the bi-phasic sample results were combined into one consolidated result, 5) both duplicate pairs and grab samples were combined using the rules discussed above, and 6) the long-term average was calculated by adding all results and dividing by the number of results.

4.9.3 Detailed Questionnaire Database Review

EPA reviewed each Detailed Questionnaire for the following: 1) completeness, 2) internal consistency, and 3) outliers. Outliers refer to data values that are well outside those expected for this industry. For example,

EPA considered flow rates above 10 million gallons per day to be outliers. In cases such as this, the QA/QC reviewer would verify the accuracy and correctness of the data.

All information that EPA entered into a computer database was given a 100 percent QA/QC check to ensure that all data were inputted properly. This was accomplished by double key entry, and any discrepancies between the two inputted values compared with the original submission were corrected by the QA/QC reviewer.

Section 4.3.2 discusses additional handling procedures for Detailed Questionnaires.

4.9.4 Detailed Monitoring Questionnaire Data Review

EPA evaluated Detailed Monitoring Questionnaire data using the same procedures outlined for the Detailed Questionnaire process. The QA/QC steps included reviews for the following: 1) completeness, 2) internal consistency, and 3) outliers.

Section 4.4 discusses additional handling procedures for Detailed Monitoring Questionnaires.

Table 4-2: Types of Facilities Included in EPA's Characterization and Engineering Site Visits

Ownership Type	Characterization Site Visits	Engineering Site Visits*
Municipal	4	9
Commercial	9	8
Non-Commercial (captive, intra-company)	2	1
Waste Type	Characterization Samples Collected	
Subtitle D	13	15
Subtitle C	5	3
Landfill Type	Characterization Samples Collected	
Subtitle D Non-Hazardous	10	15
(Municipal)	(2)	(14)
(Non-Municipal)	(8)	(1)
Subtitle C Hazardous	5	3
Ground Water	3	0

*One engineering site visit was conducted outside the U.S.

Table 4-3: Types of Facilities Included in EPA's Field Sampling Program

Episode	Ownership Type			Waste Type		Landfill Subcategory		Treatment Technology
	Municipal	Commercial	Non-Commercial	Subtitle D	Subtitle C	Non-Hazardous	Hazardous	
4626	X			X		X		Equalization, chemical precipitation, biological treatment, filtration
4667	X			X		X		Equalization/stripper, chemical precipitation, biological treatment, GAC, filtration
4687	X			X		X		Equalization, filtration, reverse osmosis
4690			X		X		X	Air stripping Steam stripping
4721		X			X		X	Equalization, biological treatment
4759		X			X		X	Equalization, chemical precipitation, biological treatment

Table 4-4: Episode Numbers for the Engineering Site Visits and Field Sampling Efforts

Episode Number	Sampling/ Site Visits
4491	E, C
4503	C
4626	E, W
4630	C
4631	C
4638	C
4639	C
4644	C
4667	E, W
4683	C
4687	E, W
4738	C
4690	E, W, C
4721	E, W, C
4684	C
4685	C
4759/4682	E, W, C
4659	C
-	E
-	E
-	E
-	E
-	E
-	E
-	E
-	E
-	E
-	E
-	E

C = Raw Wastewater Characterization Sampling Episode (1-day sampling episode)
E = Engineering Site Visit
W = Five-day Sampling Episode

5.0 INDUSTRY SUBCATEGORIZATION

In developing technology-based regulations for the Landfills industry, EPA considered whether a single set of effluent limitations and standards should be established for the industry, or whether different limitations and standards were appropriate for subcategories within the industry. The Clean Water Act (CWA) requires EPA, in developing effluent limitations, to assess several factors, including manufacturing processes, products, the size and age of a site, wastewater use, and wastewater characteristics. The Landfills industry, however, is not typical of the industries regulated under the CWA. Therefore, EPA looked at additional factors that are specifically tailored to the characteristics of landfill operations in deciding appropriate limitations for landfill facilities. The factors considered for the subcategorization of the Landfills industry are listed below:

- Resource Conservation and Recovery Act (RCRA) Regulatory classification
- Types of wastes received
- Wastewater characteristics
- Facility size
- Ownership
- Geographic location
- Facility age
- Economic impacts
- Treatment technologies and costs
- Energy requirements
- Non-water quality impacts

5.1 Subcategorization Approach

Based on an evaluation of the above factors, EPA determined that there was a notable distinction between wastewater associated with Subtitle C landfills and those from Subtitle D landfills. A wider range of toxic

organic pollutants and higher concentration of metals was found at the Subtitle C landfills. Thus, the most significant differences observed in wastewater characteristics at landfills are directly correlated to the wastes received at the landfill which, in turn, are most obviously linked to the landfill's RCRA status. Therefore, EPA concluded that the most appropriate basis for subcategorization is by landfill classification under RCRA.

Additionally, the Agency believes that this subcategorization approach has the virtue of being easiest to implement because it follows the same classification previously established under RCRA and is currently in use (and widely understood) by permit writers and regulated entities. The Agency believes that any subcategorization at odds with existing RCRA classification approaches will potentially create unnecessary confusion to the regulated community. The subcategories are described below.

5.2 Landfills Subcategories

EPA is subcategorizing the Landfills industry into two subcategories as follows:

RCRA Subtitle C Hazardous Waste Landfill Subcategory

Subpart A of 40 CFR Part 445, "RCRA Subtitle C Hazardous Waste Landfill Subcategory," applies to wastewater discharges from a solid waste disposal facility subject to the criteria in 40 CFR Part 264 Subpart N - "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" and 40 CFR Part 265 Subpart N -"Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities." Hazardous waste landfills are subject to requirements outlined in 40 CFR Parts 264 and 265 that include the requirement to maintain a leachate collection and removal systems during the active life and post-closure period of the landfill. For a discussion of these criteria, see Chapter 3, Section 3.1: "Regulatory History of the Landfills Industry", or see the Preamble to the proposed landfill guideline at 63 FR 6426, 6430-31. (February 6, 1998).

RCRA Subtitle D Non-Hazardous Waste Landfill Subcategory

Subpart B of 40 CFR Part 445, "RCRA Subtitle D Non-Hazardous Waste Landfill Subcategory," applies to wastewater discharges from all landfills classified as RCRA Subtitle D non-hazardous landfills subject to either of the criteria established in 40 CFR Parts 257 (Criteria for Classification of Solid Waste Disposal Facilities and Practices) or 258 (Criteria for Municipal Solid Waste Landfills). For a discussion of these criteria, see Chapter 3, Section 3.1: "Regulatory History of the Landfills Industry", or see the Preamble to the proposed landfill guideline at 63 FR 6426, 6431-32 (February 6, 1998).

Table 5-1 presents the subcategorization of all of the landfill facilities in the EPA database by questionnaire identification number. All landfill facilities included in this table completed a Detailed Questionnaire and collect wastewater; however, not all of the facilities included in this table are within the scope of the rule. Landfill facilities not covered by this rule include captive landfills, landfills that generate no in-scope wastewater, and zero or alternative discharge facilities. Chapter 2 discusses further the applicability of the rule.

5.3 Other Factors Considered for Basis of Subcategorization

EPA also evaluated the appropriateness and significance of developing subcategories based on the other factors presented earlier in this chapter. The following subsections present EPA's evaluation of each of these factors.

5.3.1 Types of Wastes Received

The type of solid waste that is deposited in a landfill often has a direct correlation to the characteristics of the leachate produced by that landfill. Wastes deposited in landfills range from municipal solid waste and non-hazardous materials to hazardous wastes containing contaminants such as pesticides. An analysis of the data collected as part of this study showed that there are differences in the wastewater generated by facilities that dispose of hazardous wastes as compared to non-hazardous wastes. These differences are reflected in both the number and types of pollutants of interest (as defined in Chapter 7) identified in each

subcategory and in the concentrations of these pollutants found in the wastewater generated. Tables presented in Chapters 6 (Tables 6-9 through 6-15) and 7 (Tables 7-1 and 7-2) of this document show these differences.

Specifically, the pollutants of interest list for the Non-Hazardous subcategory contains a total of 32 pollutants, whereas the pollutants of interest list for the Hazardous subcategory contains 63 pollutants (see Chapter 7 for discussion on pollutants of interest). In addition, there are more than twice as many pollutant-of-interest metals present in the hazardous landfill leachate (12) as in non-hazardous landfill leachate (5), and there are twice as many organic pollutants of interest present at hazardous landfills (28) than at non-hazardous landfills (14). Pollutants analyzed during EPA sampling episodes were detected approximately 47 percent of the time at hazardous facilities versus approximately 31 percent of the time at non-hazardous facilities. Tables 6-9 through 6-13 in Chapter 6 present the median, minimum, and maximum concentrations of the pollutants of interest for both subcategories and, although there are cases where the concentrations found at non-hazardous landfills are greater than the concentrations found at hazardous landfills, EPA detected higher concentrations of most pollutants of interest at hazardous landfills. In the proposed rule, EPA included data from numerous CERCLA facilities in the calculation of hazardous landfill raw wastewater pollutant characteristics. However, since these discharges consisted primarily of ground water and because the final rule does not cover ground water, EPA decided not to use the CERCLA data to characterize hazardous landfills. Table 5-2 presents the median concentrations of pollutants of interest common to both subcategories for hazardous and non-hazardous landfills.

In conclusion, EPA has determined that the most practical method of distinguishing the type of waste deposited in a landfill is achieved by utilizing the RCRA classification of landfills. As discussed in Section 5.1, the RCRA classification selected as the basis for subcategorization is based on the type of waste received by the landfill, hazardous or non-hazardous. Therefore, the type of waste disposed at a landfill is a factor that is taken into consideration because it is directly encompassed by the RCRA classification scheme -- the selected subcategorization method.

In addition to subcategorizing the Landfills industry based on RCRA classification, EPA also considered further subcategorizing the Subtitle D Non-Hazardous subcategory to account for differences between non-hazardous landfills and non-hazardous monofills. Subtitle D monofills, a class of non-hazardous landfills, accept only one type of waste that include, but are not limited to, construction and demolition debris, ash, and sludge. EPA decided not to further subcategorize Subtitle D landfill facilities. This decision is based on the following two considerations: (1) similarities in waste acceptance and leachate characteristics between monofills and other Subtitle D Non-Hazardous landfills; and (2) ease of implementation. First, EPA compared the number and type of pollutants present in Subtitle D municipal and non-municipal leachate. As shown in Table 6-9 in Chapter 6, there are nine pollutants of interest for Subtitle D non-municipal solid waste landfills whereas there are 32 pollutants of interest for Subtitle D municipal solid waste landfills. Although there were fewer pollutants of interest detected at non-municipal solid waste landfills, there were no pollutants of interest at non-municipal solid waste landfills that were not also present at municipal solid waste landfills. This is not unexpected, as the waste deposited in municipal solid waste landfills and dedicated monofills is not mutually exclusive. Although cells at a dedicated landfill may prohibit disposal of municipal refuse, a municipal solid waste landfill may also accept ash, sludge, and construction and demolition wastes. EPA also compared the median raw wastewater concentration data from Subtitle D municipal solid waste and non-municipal solid waste landfills in the EPA database in Table 6-9 and determined that the concentrations present at non-municipal solid waste landfills were equivalent to or less than the concentrations present at municipal solid waste landfills. EPA acknowledges that certain types of Subtitle D non-municipal solid waste landfills have a low organic content in their wastewater, and as a result some monofills, such as ash monofills, may not be able to operate biological treatment systems such as those selected for BPT/BAT for the Non-Hazardous subcategory. For those monofills that do not accept organic wastes, EPA found that many of the facilities could meet the subcategory limitations without treatment and, for those that could not, alternative technologies were available at costs no greater than those technologies EPA evaluated (and determined) to be economically achievable for the subcategory as a whole. EPA included the costs associated with these alternate technologies in the final cost impact analysis. See Chapter 11 for further discussion.

To further assess the differences between municipal solid waste and non-municipal solid waste landfills in the Non-Hazardous subcategory, EPA evaluated leachate characteristics from Subtitle D non-municipal solid waste landfills in published reports. Table 5-3 includes data from three reports[1] that analyzed construction and demolition monofills, ash monofills, and co-disposal sites and compares these data to the median raw wastewater data collected from non-hazardous municipal solid waste landfills as part of the Landfills industry study. The data contained in these reports indicate that the leachate characteristics at construction and demolition, co-disposal, and ash monofill facilities are comparable to the leachate characteristics from municipal solid waste landfills. Both the number and type of parameters in the leachate do not differ among these types of facilities, and concentration levels for all pollutants are comparable, with many parameters found at lower concentrations in the data from the construction and demolition, co-disposal, and ash monofill facilities. Therefore, EPA has concluded that untreated leachate characteristics at these facilities were not significantly different than at other non-hazardous landfill facilities and did not merit further subcategorization.

In addition, EPA collected data from six Subtitle D monofills during the EPA sampling program, including two sludge monofills, two ash monofills, and two construction and demolition monofills. Table 5-4 presents the average raw wastewater data for selected pollutants, along with the types of waste landfilled at each monofill. EPA evaluated its monofill data along with commenter submitted data and the data referenced in Table 5-3 and determined that there are differences in wastewater characteristics between different types of monofills. Most of these differences result from the fact that not all monofills accept the same types of waste. Some monofills accept primarily organic wastes (construction and demolition, sludge), others accept primarily inorganic wastes (ash, lime), and many monofills accept a combination of organic and inorganic wastes. As a result of the various types of monofills, EPA determined that a single subcategory for all monofills would still not address the situation where a certain class of constituents is regulated even

[1] "A Study of Leachate Generated from Construction and Demolition Landfills", Department of Environmental Engineering Sciences, University of Florida, August 1996; "Characterization of Municipal Waste Combustion Ashes and Leachates from Municipal Solid Waste Landfills, Monofills, and Co-Disposal Sites", U.S. EPA, EPA 530-SW-87-028D, October 1987; "Characterization of Municipal Waste Combustion Ash, Ash Extracts, and Leachates", U.S. EPA, EPA 530-SW-90-029A, March 1990.

though not all types of monofills contain those constituents (e.g. a utility ash monofill with low raw wastewater BOD_5 concentrations would still be in the same subcategory as a sludge monofill which may contain moderate levels of BOD_5). Thus, EPA would need to establish a separate subcategory for each type of monofill to address the differences among them. Therefore, rather than develop multiple monofill subcategories, EPA decided that, since the types of pollutants and concentrations of pollutants found at monofills are, for the most part, equivalent to or less than those found at municipal solid waste landfills, a single subcategory is appropriate for Subtitle D landfills. EPA concluded that the pollutants regulated for the Subtitle D Non-Hazardous subcategory will control the discharges from all types of Subtitle D landfills, including monofills.

The second consideration was based on ease of implementation. As discussed in Section 5.2, the RCRA classification scheme selected as the basis for subcategorization clearly defines non-hazardous, hazardous, and municipal solid waste landfill facilities. However, RCRA does not make any further distinction nor further divide the Subtitle D landfill facilities based on whether they are monofills or if they receive multiple types of waste. Therefore, by further subcategorizing the Subtitle D facilities into monofills and multiple waste landfills, a new classification scheme would be introduced to permit writers and regulated facilities. EPA concluded that the current RCRA classification scheme is widely understood by permit writers and regulated landfill facilities, making it the easiest of the subcategorization approaches to implement. Additionally, there are many facilities that operate both dedicated cells (similar to monofills) and municipal solid waste cells at the same landfill and commingle the wastewater prior to treatment. Establishing one subcategory for all non-hazardous landfills will ease implementation issues and adequately control discharges from the Landfills industry.

5.3.2 Wastewater Characteristics

EPA concluded that leachate characteristics from non-hazardous and hazardous landfills differed significantly from each other in the types of pollutants detected and the concentrations of those pollutants. The tables supporting this conclusion are presented in Chapter 6 (Tables 6-9 through 6-13) and Chapter

7 (Tables 7-1 and 7-2) of this document. As expected, EPA found that the leachate from hazardous landfills contained a greater number of contaminants at higher concentrations than leachate from non-hazardous landfills, as discussed in Section 5.3.1. This conclusion supports subcategorization based on RCRA classification of hazardous and non-hazardous landfills.

In EPA's evaluation of contaminated ground water, the wastewater characteristics of contaminated ground water from hazardous landfills differed significantly from the contaminated ground water characteristics at non-hazardous waste landfills, as shown in Table 5-5 and Table 5-6, respectively. Contaminated ground water from non-hazardous landfills contained only 16 pollutants of interest (as defined in Chapter 7) compared to the contaminated ground water from hazardous waste landfills which contained a total of 54 pollutants of interest. In addition, effluent data collected in support of this rule demonstrate that contaminated ground water flows at hazardous and non-hazardous facilities are, in general, currently adequately treated as a result of existing corrective action programs under RCRA.

Due to the site-to-site variability of contaminated ground water, EPA has decided that the treatment of these flows is best addressed through the RCRA Corrective Actions program. RCRA Corrective Action programs at the federal, state, and local level have the ability to consider the site-to-site variability of the contaminated ground water and provide the most applicable treatment necessary to control the contaminants. Therefore, EPA has decided to exclude contaminated ground water from this regulation. Chapter 2 fully describes EPA's decision not to include contaminated ground water as a landfill wastewater covered by this regulation.

5.3.3 Facility Size

EPA considered subcategorization of the Landfills industry on the basis of facility size and found that landfills of varying sizes generate similar wastewater and use similar treatment technologies. Based upon a review of the industry-provided data in the landfills' database, there was no observed correlation between waste acceptance amount or wastewater flow rate and the selection of treatment technologies. For

example, a landfill facility can add cells or increase its waste receipt rate depending on the local market need without altering or changing the characteristics of the wastewater generated. In addition, the size of a landfill was not determined to be a factor in cost-effectiveness of the regulatory options considered by EPA. Finally, EPA has determined that wastewater from landfills can be treated to the same level regardless of facility size. EPA did not promulgate a de-minimis flow exemption for this guideline; however, EPA has accounted for landfill facilities that generate small volumes of wastewater by estimating compliance costs for the BPT/BAT options based on treating their wastewater off-site at a CWT facility (see Section 9.2.5).

5.3.4 Ownership

EPA considered subcategorizing the industry by ownership. A significant number of landfills are owned by state, local, or federal governments, while others are commercially or privately owned. Landfills generally fall into the following two major categories of ownership: municipal or private. Landfills owned by municipalities are primarily designed to receive non-hazardous solid waste such as municipal solid waste, non-hazardous industrial waste, construction and demolition debris, ash, and sludge. However, municipally-owned landfills may also be designed to accept hazardous wastes.

Privately-owned landfills can also provide for the disposal of non-hazardous solid waste such as those mentioned above, and, like municipally-owned facilities, may also be designed to accept hazardous wastes. EPA found that current commercially- and municipally-owned landfills generally accept and manage wastes strictly by the RCRA classification and, although there are distinct economic differences, there is no distinction in the wastewater characteristics and wastewater treatment employed at commercially- or municipally-owned landfills. Since all landfill types could be of either ownership status, EPA determined that subcategorization based upon municipal and private ownership was not appropriate.

5.3.5 Geographic Location

EPA considered subcategorizing the industry by geographic location. Landfill sites are not limited to any

one region of the United States. A table presenting the number of landfills by state is presented in Chapter 3 (Table 3-1). While EPA included landfills from all sections of the country in the Agency's survey efforts, collection of wastewater characterization data as part of EPA's sampling episodes was limited to landfill facilities in the Northeast, South, and Midwest, where annual precipitation is either average or above average. Although wastewater generation rates appear to vary with annual precipitation, which is indirectly related to geographic location, EPA could not establish a direct correlation between leachate characteristics and geographic location due to lack of sampling data from arid parts of the United States. However, the Agency believes that seasonal variations in rainfall cause only minor fluctuations in leachate characteristics due to dilution effects and volume of leachate generated. In addition, many landfill facilities have developed site-specific best management practices to control the amount of rainwater that enters a landfill and eventually becomes part of the leachate. These practices include proper contouring of landfill cells, extensive use of daily cover, and capping of inactive landfill cells to minimize the amount of rainwater that enters the landfill. EPA's data collection efforts indicate that landfill facilities in less arid climates are more likely to use these management practices to control their wastewater generation and flows to the on-site wastewater treatment plant. The data collected by EPA did not indicate any significant variations in wastewater treatment technologies employed by facilities in colder climates versus warmer climates.

EPA notes that geographic location may have a differential impact on the costs of operating a landfill. For example, the cost of additional equipment required for the operation of the landfill or treatment system or tipping fees charged for the hauling of waste may differ from region to region. These issues were addressed in the economic impact assessment of the final rule.

Therefore, since the effect of geographic location appears to have a minimal impact on wastewater characteristics or can be easily addressed at minimal effort and cost, EPA determined that subcategorization based upon geographic location was not appropriate.

5.3.6 Facility Age

EPA considered subcategorization based on the age-related changes in leachate concentrations of pollutants for different age classes of landfills based on the evaluation of several factors. Several considerations lead to the conclusion that age-related limits are not appropriate. First, a facility's wastewater treatment system typically receives and commingles leachate from several landfills or cells of different ages. The Agency has not observed any facility which has found it advantageous or necessary to treat age-related leachates separately. The Agency did, however, sample two landfill facilities that had only one cell. One of the facilities had been receiving wastes for nine years in its landfill cell, while the other facility had only been receiving waste for one year. EPA compared the raw wastewater concentrations of the constituents in these two cells and found the concentrations to be very similar. In addition, most of the constituents in both cells were close to the median raw wastewater concentration for the Non-hazardous subcategory. Second, based on responses to the questionnaire, discussions with landfill operators and historical data, EPA understands that leachate pollutant concentrations appear to change substantially over the first two to five years of operation but then change only slowly thereafter.

These two observations imply that treatment systems must be designed to accommodate the full range of concentrations expected in influent wastewater. EPA concluded that the BPT/BAT/NSPS treatment technologies are able to treat the variations in landfill wastewater likely to occur due to age-related changes. EPA has taken into account the ability of treatment systems to accommodate age-related changes in leachate concentrations, as well as short-term fluctuations by promulgating effluent limitations which reflect the variability observed in monitoring data spanning up to three years.

Additionally, EPA addressed age-related effects on treatment technologies, costs, and pollutant loads by utilizing data collected from a variety of landfills in various stages of age and operation (e.g. closed, inactive, active). EPA sampled landfills of various ages and stages of operation (active, inactive, closed), lined and unlined, and concluded that the landfill database used to develop the effluent limitations represents leachate typically found at Subtitle D landfills. In addition, EPA received comments from several commenters stating

that the leachate characterization data presented in the proposal was consistent with their own monitoring data.

However, several commenters on the proposed rule stated that EPA's sampling data did not represent adequately the age-related differences that can exist between leachates from landfills of different ages. Table 5-7 presents the age of the landfills sampled by EPA. The table includes the sampling episode number and RCRA classification of each landfill, the number of cells in each landfill, whether the landfill is lined or not, the year the landfill began accepting waste, the year it stopped accepting waste, and the projected landfill closure date, if available. All information on landfill ages were obtained from the Detailed Questionnaire or the sampling reports from these facility's sampling episodes. All of EPA's sampling episodes occurred during a two year period from 1993 to 1995. Grouping facilities shown in Table 5-7 according to the year the facility began accepting waste and by regulatory history, there are ten pre-1980 landfills (before 1980 Section 3001 of RCRA); five landfills that fall in the 1980 to 1983 range (before the 1984 Hazardous and Solid Waste Amendment to RCRA); five landfills that fall in the 1984 to 1988 range (before Land Disposal Restrictions (LDR)); and five landfills that are post-1988 (after LDR). The landfill facilities sampled by EPA were between one and 43 years of age at the time of sampling. As seen in Table 5-7, the majority of landfill facilities sampled contained more than one cell, and often more than one landfill, and many of these landfill facilities commingled the leachate discharges from cells and landfills of various ages. As mentioned above, the Agency sampled raw wastewater at two landfill cells of different ages and found the concentrations of constituents to be very similar. EPA did not identify any facility that treated leachates separately due to differences in age.

To determine if significant differences existed between landfills of various ages, EPA compared pollutant concentration data from Subtitle D landfill facilities of different ages in the EPA database. Table 5-8 presents the median raw wastewater concentration for selected conventional, nonconventional, organic and metal pollutants for non-hazardous landfills with available raw wastewater data in the EPA database by age group. EPA determined the raw wastewater median concentrations in the table by: 1) calculating the

average concentration of a pollutant at a landfill facility using data from EPA sampling episodes, Detailed Questionnaires, and Detailed Monitoring Questionnaires, and then 2) calculating the median concentration of the landfill facility average concentrations.

As seen in Table 5-8, when landfills of various ages from EPA's landfill effluent guidelines database are compared, it is difficult to pinpoint any particular trend (i.e. organic pollutant concentrations decrease significantly with age). The absence of any particular trend associated with pollutant concentrations across landfill facilities of various ages may be due to the fact that most of the older landfill facilities in EPA's database have newer landfill cells whose leachate is commingled for treatment with the leachate from the older landfill cells. EPA acknowledges that age-related changes in landfill leachate characteristics would be expected from individual landfill cells. Most of the older landfill cells have lower concentrations of BOD_5, COD, and most organic pollutants indicating a smaller amount of degradable compounds from the aged waste (reference 13). In addition, aged leachates contain high levels of chemically reduced compounds, such as ammonia, and high chlorides because of the anaerobic environment of the landfill. These trends tend to be true for individual landfill cells. Again, however, as mentioned above, the Agency sampled raw wastewater at two landfill cells of different ages and found the concentrations of constituents to be very similar. However, when looking at a landfill facility as a whole (where leachates from several cells of various ages are commingled for treatment), the landfills effluent guidelines database does not fully support such a trend. Furthermore, the time frame of these age-related changes is not consistent in every landfill. Several factors including size of a cell, composition and disposition of refuse, precipitation levels, and the influence of leachate from older cells on newer cells, can, and do, affect how a leachate's composition changes with time. However, in general, these pollutant concentrations are within the same order of magnitude and the Agency concluded that this age-related variability in wastewater characteristics can be adequately controlled by the BPT/BAT treatment options, as demonstrated by the BAT facilities sampled by EPA.

Based on this analysis of the effects of age on wastewater characteristics, EPA determined that subcategorization based on facility age is not appropriate.

5.3.7 Economic Characteristics

EPA also considered subcategorizing the industry based on the economic characteristics of the landfill facilities. If a group of facilities with common economic characteristics, such as revenue size, was in a much better or worse financial condition than others, EPA could consider subcategorization on economics. However, based on the results of the Detailed Questionnaires, financial conditions of facilities showed no significant pattern of variation across possible subcategories, such as municipally- and commercially-owned facilities. In addition, EPA determined that the economic impacts of the compliance costs associated with the BPT/BAT regulations did not inordinately effect any particular segment of the Landfills industry. Therefore, EPA determined that subcategorization based on the economic characteristics of landfills facilities was not justified.

5.3.8 Treatment Technologies and Costs

Wastewater treatment for this industry ranges from primary systems such as equalization, screening, and settling, to advanced tertiary treatment systems such as filtration, carbon adsorption, and membrane separation. EPA found that the selected treatment technology employed at a facility was dependent on wastewater characteristics and permit requirements. Landfills with more complex mixtures of toxic pollutants in their wastewater generally had more extensive treatment systems and may utilize several treatment processes (e.g., facilities with high levels of both organic and inorganic pollutants may employ both a chemical and biological treatment system). However, subcategorizing by the waste type received by a landfill as outlined in the RCRA classification of landfills is less difficult to implement and results in addressing the same factors as using treatment processes employed. As a result, EPA did not consider treatment technologies or costs to be a basis for subcategorization.

5.3.9 Energy Requirements

The Agency did not subcategorize based on energy requirements because energy usage was not considered a significant factor in this industry and is not related to wastewater characteristics. Energy costs resulting from this regulation were accounted for in the cost section of this development document (Chapter 9) and in the economic impact assessment.

5.3.10 Non-Water Quality Impacts

The Agency evaluated the impacts of this regulation on the potential for increased generation of solid waste and air pollution. The non-water quality impacts did not constitute a basis for subcategorization. Non-water quality impacts and costs of solid waste disposal are included in the economic analysis and regulatory impact analysis for this regulation. See Chapter 10 for more information regarding non-water quality impacts.

Table 5-1: Subcategorization of the EPA Landfills Database

Hazardous Subcategory Detailed Questionnaire ID Numbers	Non-Hazardous Subcategory Detailed Questionnaire ID Numbers	
16005	16001	16128
16007	16003	16129
16017	16008	16130
16018	16009	16131
16019	16011	16132
16031	16012	16135
16032	16013	16137
16034	16014	16139
16036	16015	16148
16037	16016	16150
16040	16020	16151
16041	16023	16152
16042	16024	16153
16044	16025	16154
16045	16026	16155
16051	16027	16156
16066	16028	16158
16067	16029	16159
16068	16033	16160
16069	16035	16161
16081	16038	16162
16086	16039	16163
16087	16043	16164
16094	16046	16165
16095	16047	16166

Table 5-1: Subcategorization of the EPA Landfills Database (continued)

Hazardous Subcategory Detailed Questionnaire ID Numbers	Non-Hazardous Subcategory Detailed Questionnaire ID Numbers	
16101	16048	16170
16104	16049	16171
16105	16050	16173
16106	16052	16174
16108	16053	16175
16110	16054	16176
16134	16055	16177
16136	16056	16180
16140	16057	16184
16141	16058	16185
16142	16059	16186
16143	16060	16187
16144	16061	16189
16145	16062	16190
16146	16063	16191
16147	16064	16193
16149	16065	16196
16167	16070	16199
16168	16071	16200
16169	16072	16201
16178	16073	16202
16179	16074	16203
16182	16075	16204
16183	16076	16205
16192	16077	16206

Table 5-1: Subcategorization of the EPA Landfills Database (continued)

Hazardous Subcategory Detailed Questionnaire ID Numbers	Non-Hazardous Subcategory Detailed Questionnaire ID Numbers	
16197	16078	16208
16210	16079	16211
16218	16083	16212
16235	16084	16215
16238	16085	16217
	16088	16219
	16090	16220
	16091	16221
	16092	16222
	16093	16223
	16097	16224
	16098	16225
	16099	16228
	16102	16230
	16103	16231
	16107	16232
	16109	16233
	16111	16234
	16113	16236
	16114	16239
	16115	16240
	16116	16241
	16117	16242
	16118	16243
	16119	16245

Table 5-1: Subcategorization of the EPA Landfills Database (continued)

Hazardous Subcategory Detailed Questionnaire ID Numbers	Non-Hazardous Subcategory Detailed Questionnaire ID Numbers	
	16120	16246
	16121	16248
	16122	16249
	16123	16250
	16124	16251
	16125	16252
	16127	16253

Table 5-2: Raw Wastewater Median Concentrations of Pollutants of Interest Common to Both the Hazardous and Non-Hazardous Landfill Subcategories

Non-Hazardous Pollutants of Interest	Hazardous Median Concentration	Non-Hazardous Median Concentration*
(mg/L)		
Ammonia	268	75 - 82
BOD	621	67 - 240
COD	1,309	994 - 1,100
Nitrate/Nitrite	1.6	0.65 - 0.95
TDS	15,958	2,894 - 4,850
TOC	441	236 - 377
Total Phenols	25	0.25 - 0.57
TSS	151	21 - 137
(ug/L)		
1,4-Dioxane	466	11
2-Butanone	1,048	1,082
2-Propanone	2,889	992
4-Methyl-2-Pentanone	500	101
Alpha Terpineol	96	123
Benzoic Acid	2,482	100
Hexanoic Acid	2,703	5,818
Methylene Chloride	118	37
O-Cresol	79	15
Phenol	4,400	102
P-Cresol	144	75
Toluene	104	108
Tripropyleneglycol Methyl Ether	853	197
Chromium	36	28
Strontium	3,044	1,671 - 4,615

Table 5-2: Raw Wastewater Median Concentrations of Pollutants of Interest Common to Both the Hazardous and Non-Hazardous Landfill Subcategories (continued)

Non-Hazardous Pollutants of Interest	Hazardous Median Concentration	Non-Hazardous Median Concentration*
Titanium	33	64
Zinc	100	100

* Non-Hazardous subcategory median concentrations are presented as a range because raw wastewater data was calculated separately for municipal solid waste and non-municipal solid waste facilities.

Table 5-3: Comparison of Subtitle D Non-Municipal and Municipal Raw Wastewater Pollutant Concentrations (ug/L)

Pollutant	C & D Study		EPA Characterization Studies - Data Range			Subtitle D Municipal Raw Wastewater Median Concentration		
			1990	1987				
Metals	Mean [1]	Facilities Det/Total[2]	Ash Monofills	Co-Disposal	Monofills	Median	Mean	Max
Arsenic	12.3	12/16	ND(50) - 400	8 - 46	10 - 218	32.4	50.4	179
Barium	661	13/13	ND(2) - 9,220	270 - 890	NA	483	720	3,500
Boron	NA	NP	NA	NA	NA	3,910	3,874	16,250
Chromium	NA	NP	ND(7) - 32	ND(10) - 13	5 - 914	28	46	240
Hexavalent Chromium	NA	NP	NA	NA	NA	30	77	247
Molybdenum	NA	NP	NA	NA	NA	10	27	69
Silicon	NA	NP	470 - 15,300	NA	NA	15,759	28,817	159,000
Strontium	NA	NP	NA	NA	NA	1,671	1,569	2,146
Titanium	NA	NP	NA	NA	NA	64	66	157
Zinc	658	15/15	5.2 - 370	9 - 1,210	48 - 3,300	100	1,476	31,813
Organics								
1,4-Dioxane	49	1/5	NA	NA	NA	11	118	323
2-Butanone	NA	NP	NA	NA	ND(50)	1,082	5,119	36,544
2-Propanone	NA	NP	NA	NA	ND(50)	991	2,407	8,614
4-Methyl-2-Pentanone	130	2/8	NA	NA	ND(50)	101	3,789	46,161
Alpha Terpineol	NA	NP	NA	NA	ND(50)	123	334	1,061
Benzoic Acid	15,457	4/9	ND(50) - 73	NA	ND(50)	100	7,220	33,335
Dichloroprop	NA	NP	NA	NA	ND(50)	6	10	29
Disulfoton	3.3	2/4	NA	NA	NA	6	9	20
Hexanoic acid	NA	NP	NA	NA	ND(50)	5,818	13,148	37,256
MCPA	NA	NP	NA	NA	NA	403	816	4,370
MCPP	NA	NP	NA	NA	NA	233	432	1,900
Methylene Chloride	26.4	4/9	NA	NA	ND(50)	37	70	237
N,N-Dimethylformamide	NA	NP	NA	NA	ND(50)	10	214	1,008
O-Cresol	50	2/8	NA	NA	ND(50)	15	298	2,215
Phenol	384	3/6	ND(10) - 32	ND(50) - 2,100	ND(1.5)	102	287	1,425
P-Cresol	NA	NP	NA	NA	ND(50)	75	246	998
Toluene	61	7/9	NA	ND(50) - 120	ND(50)	108	166	598
Tripropyleneglycol Methyl Ether	NA	NP	NA	NA	ND(50)	197	568	1,235

Table 5-3: Comparison of Subtitle D Non-Municipal and Municipal Raw Wastewater Pollutant Concentrations (ug/L) (continued)

Pollutant	C & D Study		EPA Characterization Studies - Data Range			Subtitle D Municipal Raw Wastewater Median Concentration		
			1990		1987			
Conventional/Nonconventionals	Mean [1]	Facilities Det/Total[2]	Ash Monofills	Co-Disposal	Monofills	Median	Mean	Max
BOD	87,320	14/14	NA	NA	NA	240,000	1,228,534	7,609,318
COD	754,500	16/17	NA	1,300,000 -	5 - 1,200,000	994,000	2,024,932	11,881,700
Ammonia Nitrogen	20,420	16/78	4,380 - 77,400	3,900,000	1,200 - 36,000	81,717	238,163	2,900,000
TDS	2,263,100	17/18	924,000 - 41,000,000	160,000 - 410,000	NA	2,894,289	4,195,518	17,533,000
TSS	1,859,100	17/18	NA	NA	NA	137,000	735,308	14,470,000
Total Phenols	620	7/7	NA	1,930,000 -	NA	571	142,838	2,051,249
Nitrate/Nitrite	NA	NP	NA	7,970,000	NA	651	5,844	50,800
TOC	306,540	7/7	17 - 420,000	NA	59,100 - 636,000	376,521	661,477	3,446,084
				NA				
				438,000 - 1,310,000				
Dioxins/Furans								
1234678-HpCDD	NA	NP	ND(NV) - 0.222[2]	0.12 - 0.77[2]	0.009 - 172[2]	0.00014	0.0024	0.0071
OCDD	NA	NP	ND(NV) - 0.107	0.21 - 15	0.06 - 120	0.0018	0.030	0.0824

All units in ug/l unless otherwise noted
*: The number of sites that detected the parameter/the total number of sites that sampled the parameter
(1): Mean includes non-detects for metals and conventionals/nonconventionals and does not include non-detects for organics and dioxins/furans
(2): Total homolog concentration
NA: Not Analyzed
ND: Not Detected
NV: Not Available
NP: Not Applicable

Table 5-4: Summary of EPA Sampling Data for Subtitle D Monofills Average Raw Leachate Data for Selected Pollutants

Episode	Waste Type Landfilled	BOD_5	TSS	Ammonia	Zinc	Alpha Terpineol	Benzoic Acid	P-Cresol	Phenol
		(mg/L)							
4503	mill sludge (clay, lime, cellulose), fly ash, bark	120	104	53.2	0.028	ND	ND	ND	ND
4630	POTW sludge	85	292	118	0.086	ND	ND	ND	ND
4631	municipal resource recovery ash	12	11	75	0.033	ND	ND	ND	0.092
4638	C&D debris, state-regulated non-hazardous waste	67	22	0.67	0.102	ND	ND	ND	ND
4639	municipal resource recovery ash, WWTP residues	4	4	0.1	0.06	ND	ND	ND	ND
4644	C&D, yard waste, bricks, rubble, waste oil	13	4	0.85	0	ND	ND	ND	ND

ND: Non-Detect
NA: Data not provided.

Table 5-5: Average Contaminated Ground Water Pollutant Concentrations at Hazardous Landfills in the EPA Database (ug/L)

Hazardous Groundwater Pollutant of Interest	Cas #	MDL	QID 16018	QID 16031	QID 16032	QID 16034	QID 16036	QID 16094	QID 16095		QID 16136	QID 16141	QID 16144	
			Inf	Eff	Eff	Inf	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff
1,1-Dichloroethane	75243	10		2		230	113		89	5 ND			121522	10
1,1,1-Trichloroethane	71556	10		5		180	185	1 ND	370	5 ND			37598	10
1,1,2,2-Tetrachloroethane	79345	10					0.5 ND	1 ND					218139	445
1,2,4-Trichlorobenzene	120821	10											265	19 ND
1,2-Dichlorobenzene	95501	10						1 ND					10491	19 ND
1,2-Dichloroethane	107062	10		2			4	1 ND					1376889	357
1,2,3-Trichloropropane	96184	10											1300084	138
1,3-Dichlorobenzene	541731	10											16628	19 ND
1,4-Dichlorobenzene	106467	10						1 ND					25655	19 ND
1,4-Dioxane	123911	10				46							6429	3738
2,4-Dichlorophenol	120832	10											101	109 ND
2378-TCDD	1746016	0.00001											0.00016	
2378-TCDF	51207319	0.00001											0.0066	
2,4,5-T	93765	0.2											5	
2,4,5-TP	93721	0.2											2	
2-Propanone	67641	50											25424	446
Ammonia as Nitrogen	7664417	10											27444	17760
Arsenic	7440382	10										50 ND	80	13
Benzene	71432	10	520	1							4606		37922	10
Benzoic Acid	65850	50											1330	1920
Benzyl Alcohol	100516	10											298	282
Bis(2-chloroethyl)ether	111444	10											16518	34716
Bis(2-ethylhexyl)phthalate	117817	10											1039	19 ND
BOD	C-002	2000			2700								86500	55230
Boron	7440428	100											846	770
Cadmium	7440439	5										3 ND	9	8
Chlorobenzene	108907	10	920	2				1 ND					12936	10
Chloroform	67663	10		2									132025	32
COD	C-004	5000			23600								6423889	2445850
Copper	7440508	25											53	521
Dalapon	75990	0.2											109	
Dicamba	1918009	0.2											34	
Dichlorvos	62737	5											236	

Table 5-5: Average Contaminated Ground Water Pollutant Concentrations at Hazardous Landfill in the EPA Database (ug/L) (continued)

Hazardous Groundwater Pollutant of Interest	Cas #	MDL	QID 16018	QID 16031	QID 16032	QID 16034	QID 16036	QID 16094	QID 16095		QID 16136	QID 16141	QID 16144	
			Inf	Eff	Eff	Inf	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff
Dinoseb	88857	0.5											14	
Dioxathion	78342	5											270	
Ethyl Benzene	100414	10	372	2									14694	10
Hexane Extractable Material	C-036	5000											1700222	8750
Hexanoic Acid	142621	10											16368	28013
Lithium	7439932	100											305	219
Methylene Chloride	75092	10		2									123572	40
Molybdenum	7439987	10											13	13
Naphthalene	91203	10				54					4100		3766	19 ND
Nickel	7440020	40										10	136	1462
Nitrate/Nitrite	C-005	50										1000 ND	2136	1571
Pentachlorobenzene	608935	20											4333	38 ND
Phenol	108952	10											6029	1537
Silicon	7440213	100											6738	6602
Strontium	7440246	100											17156	12360
TOC	C-012	1000											2055028	730700
Toluene	108883	10	573	2					19	5 ND	2573		22080	10
Trans-1,2-Dichloroethene	156605	10		5				1 ND					84660	14
Trichloroethene	79016	10		5			5						272606	33
TSS	C-009	4000										37000	121639	26450
Zinc	7440666	20				120							576	3451

MDL: Method detection limit

QID: Questionnaire ID

E: Sampling episode

ND: Non-detect with respect to instrument detection limit (IDL)

*: IDL is greater than detected value

Table 5-6: Average Contaminated Ground Water Pollutant Concentrations at Non-Hazardous Landfills in the EPA Database (ug/L)

Non-Hazardous Groundwater			E4683	QID 16016	QID 16085		QID 16088		QID 16129		QID 16132	QID 16163
Pollutant of Interest	Cas #	MDL	Inf	Eff	Inf	Eff	Inf	Eff	Inf	Eff	Eff	Eff
1,1-Dichloroethane	75243	10	10 ND	0.3 ND	5.5		8.6	1	22		0.35 ND	4 ND
1,1,1-Trichloroethane	71556	10	10 ND	0.5 ND	1.4 ND		2.1	1 ND	17		0.45 ND	5 ND
1,2-Dichloroethane	107062	10	10 ND	0.3 ND	1.4 ND		2.1 ND	1 ND	15		0.35 ND	8
2,4,5-T	93765	0.2	0.2 ND		0.2 ND		2		1 ND			
2,4,5-TP	93721	0.2	0.2 ND	2000 ND	0.2 ND		5		1.9 ND			
2-Propanone	67641	50	50 ND	10.5	50 ND		50 ND		742		1.3	
Ammonia as Nitrogen	7664417	10	1340		1284	256	1300	409	80551	563		
Arsenic	7440382	10	2 ND	16	4.3		3	2	13		11	25
Benzene	71432	10	10 ND	0.3 ND	1.4 ND	5.7	2.2	1 ND	13		0.35 ND	
Benzyl Alcohol	100516	10	10 ND		10 ND		10 ND		19			
BOD	C-002	2000	14000	1000	1000 ND	751	1000 ND		213655	1835		
Boron	7440428	100	173		362		97		1091			
Cadmium	7440439	5	4 ND	18	0.4	19	4 ND	15	5 ND		3.8	2
Chlorobenzene	108907	10	10 ND	0.5 ND	1.4 ND		2.1 ND	1.5 ND	12		0.35 ND	5 ND
Chloroform	67663	10	10 ND	0.5 ND	1.7		2.1 ND	1 ND	15			
COD	C-004	5000	28000	21637	51000		14000					33300
Copper	7440508	25	12	38	10 ND		10 ND		53	121	10	2.5
Dalapon	75990	0.2	0.2 ND		0.2 ND		6					
Dicamba	1918009	0.2	0.2 ND		0.2 ND		10					
Dinoseb	88857	0.5	0.5 ND		0.5 ND		3		50 ND			
Ethyl Benzene	100414	10	10 ND	0.3 ND	1.4 ND		2.1 ND	1 ND	15		0.35 ND	5 ND
Methylene Chloride	75092	10	10 ND	1	3.3 ND		2.1 ND	3.5 ND	49	0.6	0.45	
Naphthalene	91203	10	10 ND	36 ND	10 ND		10 ND		12			
Nickel	7440020	40	14 ND	30	59		14 ND	27	45	21	16	40
Nitrate/Nitrite	C-005	50	2660		1300		1340					10000 ND
Phenol	108952	10	10 ND	54.5 ND	5718 ND		10 ND		145			
Silicon	7440213	100	3530		3880		3270					
Strontium	7440246	100	201		657		200					
TOC	C-012	1000	10000 ND		40000		10000 ND				3996	
Toluene	108883	10	10 ND	0.3 ND	1.4 ND		2.1 ND	1 ND	47		0.35 ND	5 ND
Trans-1,2-Dichloroethene	156605	10	10 ND	0.3 ND	2.8	5.7	3.6	1 ND	38	0.5 ND	0.35 ND	5 ND
Trichloroethene	79016	10	10 ND	0.35	10 ND		2.1 ND	1 ND	19	0.5	0.45	1
TSS	C-009	4000	4000 ND		24000	5593	4000 ND		43848	2651		
Zinc	7440666	20	15.2	35	70		16		82	24		

MDL: Method detection limit
QID: Questionnaire ID
E: Sampling episode
ND: Non-detect with respect to instrument detection limit (IDL)
*: IDL is greater than detected value

Table 5-7: Age of Landfills in EPA Sampling Database

Episode	RCRA Classification	Number of Cells	Year Landfill Began Accepting Waste	Year Landfill Stopped Accepting Waste	Projected Closure
4491	Subtitle D Lined (varies)	25	1970	1994	1999
4503	Subtitle D Unlined	1	1974	1990	1992-3
4626	Subtitle D Lined (comp)	1	1986	1993	2000
4630	Subtitle D Lined (clay)	5	1988	1994	2003
4631	Subtitle D Lined (comp)	5	1987	-	-
	Subtitle C Lined (clay)	-	1972	1982	1991
	Subtitle C Lined (clay)	10	1972	1982	1991
4638	Subtitle D Lined (dbl comp)	5	1990	-	-
4639	Subtitle D Lined (comp)	2	1988	-	-
4644	Subtitle D Lined (clay)	2	1989	-	-
4659	Subtitle C Unlined	-	1958	1981	1981
	Subtitle C Lined (clay)	-	1981	1988	-
4667	Subtitle D Lined (varies)	4	1974	1993	1997
	Subtitle D Unlined	1	1962	1974	1991
4683	Subtitle D - GW Lined (varies)	7	1981	-	2017

Table 5-7: Age of Landfills in EPA Sampling Database (continued)

Episode	RCRA Classification	Number of Cells	Year Landfill Began Accepting Waste	Year Landfill Stopped Accepting Waste	Projected Closure
4687	Subtitle D Lined (comp)	1	1994	-	-
4690	Subtitle C Unlined	9	1952	1973	1976
	Subtitle C Lined (comp)	2	1980	1993	2008
	Subtitle C Unlined	8	1968	1979	1980
	Subtitle D Unlined	1	1992	1993	1998
	Subtitle C Lined (clay)	1	1982	1985	1986
	Subtitle D Unlined	2	1991	1993	1998
4738	Subtitle D Lined (clay)	4	1984	1994	1998
4721	Subtitle C Lined (clay)	2	1980	1993	1997
4759	Subtitle C Lined (varies)	39	1975	1993	2000

(comp): composite liner (synthetic and clay)
(varies): cells lined with either synthetic, asphalt, clay, composite or double lined composite

Table 5-8: Median Raw Wastewater Characteristics at Non-Hazardous Landfills of Varying Age

Pollutant	Landfill Age Group (Year in which Landfill Facility Began Accepting Waste)		
	Pre-1980 Median Conc.	1980-1990 Median Conc.	1991-Present Median Conc.
Ammonia	140 mg/L (15)	95 mg/L (10)	48 mg/L (3)
BOD_5	210 mg/L (18)	125 mg/L (13)	344 mg/L (4)
COD	596 mg/L (17)	930 mg/L (11)	3,038 mg/L (4)
TOC	445 mg/L (15)	377 mg/L (8)	150 mg/L (3)
TSS	202 mg/L (17)	49 mg/L (9)	100 mg/L (4)
Alpha Terpineol	746 ug/L (2)	123 ug/L (1)	-
Benzoic Acid	75 ug/L (4)	9,308 ug/L (1)	-
P-Cresol	25 ug/L (5)	117 ug/L (2)	-
Phenol	17 ug/L (8)	242 ug/L (4)	820 ug/L (1)
Chromium	27 ug/L (16)	31 ug/L (9)	10 ug/L (3)
Zinc	145 ug/L (16)	93 ug/L (12)	139 ug/L (4)

( ): Parentheses denote number of observations (number of landfills with data).

6.0 WASTEWATER GENERATION AND CHARACTERIZATION

In 1994, under the authority of Section 308 of the Clean Water Act (CWA), the Environmental Protection Agency (EPA) distributed a questionnaire entitled "Waste Treatment Industry Questionnaire Phase II: Landfills" to 252 facilities that EPA had tentatively identified as possible generators of landfill wastewater. Some of the facilities employed on-site wastewater treatment, while others did not. EPA selected these facilities for survey purposes to represent a total of 1,024 potential generators of landfill wastewater. A total of 220 questionnaire respondents generated landfill leachate in 1992. This section presents information on wastewater generation at these facilities based on the questionnaire responses. In addition, this section also summarizes the information on wastewater characteristics for landfill facilities that EPA sampled and for those facilities that provided self-monitoring data.

6.1 Wastewater Generation and Sources of Wastewater

Landfill facilities do not generate "process wastewater" as EPA has traditionally defined it. At 40 CFR Part 122.2, EPA defines process wastewater as "any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, by-product, intermediate product, finished product or waste product". EPA typically uses this definition of process wastewater for manufacturing or processing operations. Since landfill operations do not include or result in "manufacturing processes" or "products", EPA refers to the wastewater treated at landfill facilities as landfill generated wastewater.

In general, the types of wastewater generated by activities associated with landfills and collected for treatment, discharge, or reuse are the following: leachate, landfill gas condensate, truck/equipment washwater, drained free liquids, laboratory derived wastewater, floor washings, recovering pumping wells, contaminated ground water, and storm water runoff. For the purposes of the Landfill industry study, EPA considers all of these wastewater sources "in-scope" except for contaminated ground water, recovering pumping wells, and non-contaminated storm water.

In 1992, landfill facilities in the U.S. generated approximately 22.7 billion gallons of wastewater. For the purposes of this guideline, EPA considers approximately 7.3 billion gallons of this wastewater "in-scope". The remaining 15.4 billion gallons of wastewater generated at landfills consist of contaminated ground water, wastewater recovered from pump wells, and non-contaminated storm water. The primary sources of wastewater at landfills are defined below.

Landfill leachate as defined at 40 CFR Part 258.2, is liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste. Over time, the seepage of water through the landfill as a result of precipitation may increase the mobility of pollutants and, thereby, increase the potential for their movement into the wider environment. As water passes through the layers of waste, it may "leach" pollutants from the disposed waste, moving them deeper into the soil. This mobility may present a potential hazard to public health and the environment through ground water contamination and other means. One measure used to prevent the movement of toxic and hazardous waste constituents from a landfill is a landfill liner operated in conjunction with a leachate collection system. Leachate is typically collected from a liner system placed at the bottom of the landfill. Leachate also may be collected through the use of slurry walls, trenches, or other containment systems. The leachate generated varies from site to site based on a number of factors including the types of waste accepted, operating practices (including shedding, daily cover, and capping), the depth of fill, compaction of wastes, annual precipitation, and landfill age. Landfill leachate accounts for over 97 percent of the total volume of in-scope wastewater.

Landfill gas condensate is a liquid which has condensed in the landfill gas collection system during the extraction of gas from within the landfill. Gases such as methane and carbon dioxide are generated due to microbial activity within the landfill and must be removed to avoid hazardous and explosive conditions. In gas collection systems, gases containing high concentrations of water vapor condense in traps staged throughout the gas collection network. The gas condensate contains volatile compounds and accounts for a relatively small percentage of flow from a landfill.

Drained free liquids are aqueous wastes drained from waste containers (e.g., drums, trucks, etc.) or wastewater resulting from waste stabilization prior to landfilling. Landfills that accept containerized waste may generate this type of wastewater. Wastewater generated from these waste processing activities is collected and usually combined with other landfill generated wastewater for treatment at the wastewater treatment plant.

Truck/equipment washwater is generated during either truck or equipment washes at landfills. During routine maintenance or repair operations, trucks and/or equipment used within the landfill (e.g., loaders, compactors, or dump trucks) are washed and the resultant wastewater is collected for treatment. In addition, it is common practice for many facilities to wash the wheels, body, and undercarriage of trucks used to deliver the waste to the open landfill face upon leaving the landfill. On-site wastewater treatment equipment and storage tanks are also periodically cleaned and their associated washwaters are collected. Floor washings generated during routine cleaning and maintenance of the facility also are collected for treatment.

Laboratory-derived wastewater is generated from on-site laboratories which characterize incoming waste streams and monitor on-site treatment performance. Landfill facilities usually combine the very small amounts of wastewater from this source with leachate and other wastewater for treatment at the wastewater treatment plant.

Contaminated storm water is storm water which comes in direct contact with landfill wastes, the waste handling and treatment areas, or wastewater that is subject to the limitations and standards. Some specific areas of a landfill that may produce contaminated storm water include (but are not limited to) the following: the open face of an active landfill with exposed waste (no cover added); the areas around wastewater treatment operations; trucks, equipment or machinery that has been in direct contact with the waste; and waste dumping areas. Storm water that does not come into contact with these areas was not considered to be within the scope of this study.

Landfill operations also generate and discharge wastewater that is not covered by this regulation. These sources include non-contaminated storm water, contaminated ground water, and wastewater from recovering pumping wells. Chapter 2: "Scope of the Regulation" discusses the exclusion of these flows. A brief description of this wastewater is presented below.

Non-contaminated (non-contact) storm water is storm water that does not come in direct contact with landfill wastes, the waste handling and treatment areas, or wastewater that is subject to the limitations and standards. Non-contaminated storm water includes storm water which flows off the cap, cover, intermediate cover, daily cover, and/or final cover of the landfill.

Contaminated ground water is water below the land surface in the zone of saturation which has been contaminated by landfill leachate. Contaminated ground water occurs at landfills without liners or at facilities that have released contaminants from a liner system into the surrounding ground water. Ground water can also infiltrate the landfill or the leachate collection system if the water table is high enough to penetrate the landfill area.

Recovering pumping wells generate wastewater as a result of the various ancillary operations associated with ground water pumping operations. These operations include construction and development, well maintenance, and well sampling (i.e. purge water). The wastewater will have very similar characteristics to contaminated ground water.

6.2 Wastewater Flow and Discharge

Tables 6-1 through 6-4 present national estimates of the flows for primary wastwater sources found at landfills reported in "Section A" of the "Waste Treatment Industry Questionnaire Phase II: Landfills". Chapter 3, Section 3.2.1 discusses how EPA calculated national estimates. The Agency based the national estimates presented in Tables 6-1 through 6-4 on 167 of the 220 facilities that generate and treat landfill leachate. EPA excluded the remaining 53 facilities from this guideline as discussed in Chapter 2. EPA

considers these 167 landfill facilities as "in-scope" facilities, or within the scope of the regulation. The tables report the flows by subcategory, as follows: Non-Hazardous subcategory (broken down into Subtitle D municipal solid waste and non-municipal solid waste facilities) and Hazardous subcategory. The tables also show the amount of wastewater flow from landfills by discharge status, as follows: direct, indirect, and zero.

Direct discharge facilities are those that discharge their wastewater directly into a receiving stream or body of water. Based on national estimates, there were no direct discharging hazardous landfills identified in the Landfills industry study. Indirect discharging facilities discharge their wastewater indirectly to a publicly-owned treatment works (POTW). Zero or alternative discharge facilities use treatment and disposal practices that result in no discharge of wastewater to surface waters or POTWs. Alternative disposal options for landfill generated wastewater include off-site treatment at another landfill wastewater treatment system or a Centralized Waste Treatment facility, deep well injection, incineration, evaporation, land application, and recirculation back to the landfill.

Tables 6-1, 6-2, and 6-3 present wastewater flows by subcategory (Hazardous and Non-Hazardous, which is divided into Municipal and Non-Municipal) and discharge type for the different types of wastewater generated by landfills in 1992. Total flows are reported for wastewater treated on site and off site, discharged untreated to a POTW or surface water, and recycled flows that are put back into the landfill. Wastewater flows identified as "Other" treatment include evaporation, incineration, or deep well injection.

Table 6-4 combines the in-scope wastewater flows from Tables 6-1, 6-2, and 6-3. Table 6-4 does not include out-of-scope flows from contaminated ground water, recovering pumping wells, or storm water. The table presents the national estimates of facilities subject to this guideline and the estimated wastewater flows from these facilities.

6.2.1 Wastewater Flow and Discharge at Subtitle D Non-Hazardous Landfills

Landfill facilities generated approximately 7 billion gallons of in-scope wastewater at non-hazardous landfills

in 1992. Flows collected from leachate collection systems are the primary source of wastewater, accounting for over 98 percent of the in-scope wastewater generated at non-hazardous landfills.

Landfill facilities subject to this guideline have several options for the discharge of their wastewater. EPA estimates that there are 143 Subtitle D non-hazardous facilities discharging wastewater directly into a receiving stream or body of water, accounting for 1.1 billion gallons per year. In addition, there are 756 facilities discharging wastewater indirectly to a POTW, accounting for 4.7 billion gallons per year.

Also, there are a number of facilities which use treatment and disposal practices that result in no discharge of wastewater to surface waters. The Agency estimates that there are 338 of these zero or alternative discharge facilities. Several zero or alternative discharge facilities in the Non-Hazardous subcategory recycle wastewater flows back into the landfill. The recirculation of leachate is generally believed to encourage the biological activity occurring in the landfill and accelerates the stabilization of the waste. The recirculation of landfill leachate is not prohibited by federal regulations, although many states have prohibited the practice. EPA estimates that 348 million gallons of landfill wastewater are recirculated back to Subtitle D non-hazardous landfill units each year.

6.2.2 Wastewater Flow and Discharge at Subtitle C Hazardous Landfills

Hazardous landfill facilities generated approximately 342 million gallons of in-scope wastewater in 1992. Flows collected from leachate collection systems are the primary source of wastewater, accounting for approximately 72 percent of the in-scope wastewater generated at hazardous landfills, and routine maintenance activities such as truck/equipment washing and floor washing account for 26 percent of the flows.

Landfill facilities have several options for the discharge of their wastewater. EPA's survey of the Landfills industry did not identify any hazardous landfills subject to the guideline that discharge in-scope wastewater

directly to surface waters. EPA estimates that there are 6 facilities discharging wastewater indirectly to POTWs, accounting for 40 million gallons per year.

The Agency estimates that 139 hazardous landfill facilities use zero or alternative discharge disposal options which account for over 302 million gallons per year. EPA estimates that 102 facilities ship wastewater off site for treatment, often to a treatment plant located at another landfill or to a Centralized Waste Treatment facility. Shipping off site accounts for 9 million gallons per year of wastewater. Another 36 facilities use underground injection for disposal of their wastewater, accounting for 312 million gallons per year, while 1 facility solidifies less than 0.1 million gallons per year of landfill wastewater.

6.3 Wastewater Characterization

The Agency collected the information reported in this section through its sampling program and data supplied by the Landfills industry via technical questionnaires. EPA sampling programs consisted of five-day events at landfills with selected BAT treatment systems (EPA sampled both raw leachate and treated effluent at these facilities) as well as one-day events to characterize raw leachate quality at landfill facilities. The Agency also used industry-provided data, as supplied in the Detailed Questionnaire and in the Detailed Monitoring Questionnaire responses, to characterize landfill generated wastewater. In addition, for the proposal, EPA used data collected as part of the Centralized Waste Treatment Industry study (see reference 31) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) ground water study (see reference 25) in the characterization of the wastewater from hazardous landfill facilities. However, after proposal, EPA decided not to include CERCLA data in characterizing hazardous landfill leachate because CERCLA discharges consisted primarily of ground water, which is not a wastewater flow covered by this regulation. Chapter 4 discusses these data sources in detail as well as the QA/QC procedures and editing rules used to evaluate these data. EPA characterized the raw wastewater for each subcategory by taking the median influent concentration from all data sources for each pollutant detected in that subcategory. This pollutant concentration is referred to as the Median Raw Wastewater Concentration File.

This section presents background information on the types of wastewater generated at landfill facilities and the factors that affect the wastewater characteristics. It also discusses the pollutant parameters analyzed and detected at EPA sampling episodes and the methodology for developing the Median Raw Wastewater Concentration File. This section also presents available literature data on the wastewater characteristics of Non-Hazardous subcategory landfill generated wastewater.

6.3.1 Background Information

Landfill generated wastewater is comprised of several wastewater sources that EPA discussed in Section 6.1. Wastewater that is subject to the landfill regulation includes landfill leachate, landfill gas condensate, truck/equipment washwater, drained free liquids, laboratory-derived wastewater, floor washings, and contaminated storm water runoff. Wastewater sources at landfills which are not subject to the landfill regulation include contaminated ground water, wastewater from recovering pumping wells, and non-contaminated storm water. The following section discusses the primary sources of in-scope landfill generated wastewater.

6.3.1.1 Landfill Leachate

Leachate is the liquid which passes through or emerges from solid waste, and contains soluble, suspended, or miscible materials removed from such waste. Several factors affect leachate quality, including the following:

- types of waste accepted/deposited
- operating practices (shredding, cover, and capping)
- amount of infiltration
- depth of fill
- compaction
- age

Waste types received for disposal are the most representative characteristic of a landfill and, therefore, of the wastewater generated, since the main contaminants in the wastewater are derived from the materials deposited into the fill (see Chapter 5: Industry Subcategorization). The amount of infiltration and the age of a landfill primarily affect the concentration of contaminants in the leachate. The remaining factors mainly influence the rate of infiltration.

EPA considered the following two factors when characterizing landfill leachate: the concentration of contaminants in the leachate and the volume of leachate generated. On a relative basis, the highest concentrations of contaminants are typically present in leachate of new or very young landfills. However, the overall loads (i.e., the mass) of pollutants are generally not very large because new landfills typically generate low volumes of leachate. As the volume of waste approaches the capacity of the landfill and the production of leachate increases, both the pollutant loadings (flow x concentration) and the concentrations of certain contaminants (mainly organic pollutants) increase. The increase of pollutant concentration is attributed to the onset of decomposition activities within the landfill and to the leachate traversing the entire depth of refuse. Therefore, large pollutant loadings from a typical landfill occur during a period of high leachate production and high contaminant levels (see reference 13). The exact periods of varying leachate production cannot be quantified readily but are site specific and dependent on each of the above variables.

Over a period of time (as the landfill ages and leaching continues), the concentration of contaminants in the leachate decreases (see reference 13). The landfill may continue to generate substantial quantities of leachate; however, pollutant loadings are lower due to the lower concentrations of soluble, suspended, or miscible contaminants remaining in the landfill. As decomposition of the landfill continues, the landfill attains a stabilized state of equilibrium where further leaching produces leachate with lower loadings than during the period of peak leachate production. This stabilized state is presumably the result of decomposition of landfill waste by indigenous microorganisms, which will remove many of the contaminants usually susceptible to further leaching.

Biological decomposition of landfill municipal refuse is often modeled after the anaerobic breakdown of other organic wastes. The following discussion of the decomposition process has been adapted from a report on the characteristics of landfill leachate prepared by the Wisconsin Department of Natural Resources (see reference 13).

Biological activity occurs in a landfill shortly after deposition of organic material. At first, wastes high in moisture content decompose rapidly under aerobic conditions, creating large amounts of heat. As oxygen is depleted, the intermediate anaerobic stage of decomposition begins. This change from aerobic to anaerobic conditions occurs unevenly through the landfill and depends upon the rate of oxygen diffusion in the fill layers. In the first stage of anaerobic decomposition, extra-cellular enzymes convert complex organic wastes to soluble organic molecules. Once the organic wastes are solubilized, the second stage of anaerobic decomposition converts them to simple organic molecules, such as acetic, propionic, and butyric acids, and other organic acids. These soluble organic acids enter the leachate percolating through a landfill, resulting in decreased pH of the leachate and increasing oxygen demand. Anaerobic activity in the landfill can also lower the reduction oxidation (redox) potential of the wastes which, under low pH conditions, can cause an increase in inorganic contaminants. Eventually, bacteria within the landfill begin converting the organic acids to methane. The absence of organic acids in the landfill increases the pH of the leachate which can lead to a decrease in the solubility of inorganic contaminants, lowering inorganic concentrations in the leachate (see reference 13).

The age or degree of decomposition of a landfill may, in certain circumstances, be ascertained by observing the concentration of various leachate indicator parameters, such as BOD_5, TDS, or the organic nitrogen concentration (see reference 13). The concentrations of these leachate indicator parameters can vary over the decomposition life of a landfill. Typically, older landfills have lower concentrations of BOD_5, COD, and most organic pollutants, indicating a smaller amount of degradable compounds from the aged waste. In addition, aged leachates can contain high levels of chemically reduced compounds, such as ammonia, and high chlorides because of the anaerobic environment of the landfill. However, using these indicator

parameters alone does not take into account any refuse-filling variables, such as processing of wastes prior to disposal and fill depth. To compensate for these additional variables, researchers examined ratios of leachate parameters over time (see reference 13). One such ratio is the ratio of BOD_5 to COD in the leachate. Leachates from younger landfills typically exhibit BOD_5 to COD ratios of approximately 0.8, while older landfills exhibit a ratio as low as 0.1. The decline in the BOD_5 to COD ratio with age is due primarily to the readily decomposable material (phenols, alcohols) degrading faster than the more recalcitrant compounds (heavy molecular weight organic compounds). As a result, as the landfill ages the BOD_5 of the leachate will decrease faster than the COD. Other ratios examined that reportedly decrease over time include the following: volatile solids to fixed solids, volatile acids to TOC, and sulfate to chloride (see reference 13).

It is common to find that the sum of individual organic contaminants does not always match the measured TOC and/or COD value. Compounds that comprise this difference are not always readily identified due to the complex nature of leachate and due to the presence of other organic compounds found in leachate. Myriad organic compounds exist in decomposing refuse and most of the organics in leachate are soluble. Reportedly, free volatile acids constitute the main organic fraction in leachate (see reference 13). However, other organic compounds have been identified in landfill leachates including carbohydrates, proteins, and humic and fulvic-like substances. Gaps in mass balance results are typically attributed to these compounds.

Responses to EPA's Detailed Questionnaire indicate that 1,625 in-scope landfills collect leachate at a median daily flow of 6,000 gallons per day. In 1992, in-scope landfills in the U.S. generated approximately 7.2 billion gallons of landfill leachate. Of this, approximately 1.6 billion gallons were treated on site, 719 million gallons were treated off site, 3.7 billion gallons were sent untreated to POTWs, 417 million gallons were sent untreated to a surface water, 348 million gallons were recycled back to the landfill, and 358 million gallons were treated or disposed by other methods, such as off-site treatment at another landfill wastewater treatment system or a Centralized Waste Treatment facility, deep well injection, incineration, evaporation, or land application.

6.3.1.1.1 Additional Sources of Non-Hazardous Leachate Characterization Data

Most of the existing literature regarding non-hazardous landfill leachate characteristics resulted from studies taken at an isolated range of municipal landfills in the 1970s and 1980s. Data presented in these reports on pollutant concentrations found in leachate are typically expressed in ranges due to the variability of leachate from various landfills. The range of pollutant concentration values, as well as the lack of specific information on factors affecting leachate results (e.g., sampling methods, analytical methods, landfill waste types, etc.) limit the usefulness of these data. However, these data are mentioned as additional background information in support of EPA's characterization activities. Table 6-5 presents a summary of available municipal leachate characteristic data from the following sources:

- Five published papers: George, 1972; Chian and DeWalle, 1977; Metry and Cross, 1977; Cameron, 1978; and Shams-Korzani and Henson, 1993.
- McGinley, Paul M. and Kmet, P. "Formation, Characteristics, Treatment and Disposal of Leachate from Municipal Solid Waste Landfills." Wisconsin Department of Natural Resources Special Report, August 1984, and
- Sobotka & Co., Inc. Case history data compiled and reported to U.S. EPA's Economic Analysis Branch, Office of Solid Waste, July 1986.

The variability and high pollutant concentrations in older landfill leachate characterization data can be attributed to landfills that accepted waste prior to the enactment of the Resource Conservation and Recovery Act (RCRA) in 1980. Landfills in operation prior to this date may have disposed of a multitude of different industrial and/or toxic wastes in addition to municipal solid waste. The disposal of these high-strength wastes could account for the large variability observed in leachate characteristics data collected from municipal landfills in this period. After the promulgation of RCRA, EPA established controls that specified the type and characteristics of wastes that may be received by either a hazardous (Subtitle C) or non-hazardous (Subtitle D) facility (see Chapter 3: Section 3.1 for the discussion on regulatory history). EPA has also mandated other control measures, such as leachate collection systems, under RCRA for both types of landfills. By instituting the acceptance criteria and leachate control standards under RCRA, the

characteristics of the leachate from both hazardous and non-hazardous landfills do not vary as greatly as observed in landfills prior to 1980. EPA's data shows that RCRA regulations have resulted in smaller concentration ranges for pollutants from landfills. EPA did observe pollutant variability in the data it collected; however, the variability was not as great as found in the data from older literature sources.

6.3.1.2 Landfill Gas Condensate

Landfill gas condensate forms in the collection lines used to extract and vent landfill gas. Condensate collects at low points in the gas collection lines and landfill facilities usually pump it to the on-site wastewater holding tank or treatment system. Responses to EPA's Detailed Questionnaire indicate that 158 in-scope landfills collect landfill gas condensate at a median daily flow of 343 gallons per day. In 1992, in-scope landfills in the U.S. generated approximately 23 million gallons of landfill gas condensate. Of this, approximately 20 million gallons were treated on site, 1.7 million gallons were treated off site, and 0.8 million gallons were sent untreated to POTWs. Of the 155 facilities collecting gas condensate, 66 commingle condensate with leachate for treatment on site, 79 facilities do not treat the condensate on site, and 10 facilities treat landfill gas condensate separately from other landfill generated wastewater.

Landfill gas condensate represents a small amount of the total wastewater flow for the industry. Hazardous waste landfills produce 9 million gallons/year of gas condensate, or about 4 percent of the leachate flow volume. Municipal solid waste landfills produce 14 million gallons/year of gas condensate, or about 0.2 percent of the leachate flow volume.

Of the 37 respondents to the Detailed Questionnaire that collect landfill gas condensate, five facilities treat the condensate separately from leachate. These facilities treated landfill gas condensate with one or more of the following technologies: equalization, neutralization, oil-water separation, granular activated carbon, and air stripping. All five facilities discharged the treated waste stream indirectly to a POTW. Table 6-6 presents landfill gas condensate monitoring data provided in the Detailed Questionnaire from two facilities that collect and treat landfill gas condensate separately from other landfill generated wastewater. Facility

16012 presented landfill gas condensate monitoring data after treatment by hydrocarbon/aqueous phase separation and caustic neutralization, and facility 16015 presented monitoring data after treatment by equalization, caustic neutralization, and carbon adsorption.

6.3.1.3 Drained Free Liquids

Drained free liquids are liquids drained from containerized waste prior to landfilling. Wastewater characteristics and volume of drained free liquids vary greatly depending upon the contents and origin of the waste. However, they will have similar characteristics to the containerized waste and, therefore, similar characteristics to landfill leachate. Drained free liquids include other wastewater generated by waste processing activities, such as waste stabilization. Waste stabilization includes the chemical fixation or solidification of the solid waste. Wastewater generated from these activities includes decant from the waste treated and any associated rinse waters. This waste processing wastewater is collected separately and then combined with leachate and other landfill operation wastewater for treatment at the wastewater treatment facility.

Responses to EPA's Detailed Questionnaire indicate that 25 in-scope landfills collect drained free liquids at a median daily flow of 3 gallons per day. In 1992, in-scope landfills in the U.S. generated approximately 0.5 million gallons of drained free liquids. Of this, approximately 715 gallons were treated on site and 47,000 gallons were treated or disposed by other methods such as treatment by a CWT or deep well injection.

6.3.1.4 Truck and Equipment Washwater

Landfill facilities generate truck and equipment washwater during either truck or equipment washes at the landfill. Depending on the type and usage of the vehicle/equipment cleaned and the type of landfill, the washwater volume and characteristics can vary greatly. For hazardous and non-hazardous landfill facilities, washwater will typically be more dilute in strength in comparison to typical leachate characteristics and contain mostly solids. Insoluble solids, consisting of mostly inorganics, metals, and low concentrations of

organic compounds are the primary source of contaminants in the washwater. Since truck and equipment washwater tends to contain the same constituents as the waste being landfilled and are similar in characteristic to the landfill leachate, they are typically combined for treatment with leachate and other landfill generated wastewater.

Responses to EPA's Detailed Questionnaire indicate that 356 in-scope landfills collect truck and equipment washwater at a median daily flow of 141 gallons per day. In 1992, in-scope landfills in the U.S. generated approximately 101 million gallons of truck and equipment washwater. Of this, approximately 38 million gallons were treated on site, 9 million gallons were sent untreated to POTWs, 1.3 million gallons were either treated off site, recycled back to the landfill, or sent untreated to a surface water, and 53 million gallons were treated or disposed by other methods, such as off-site treatment at another landfill wastewater treatment system or a Centralized Waste Treatment facility, deep well injection, incineration, evaporation, or land application.

Floor washings are also generated during routine cleaning and maintenance of landfill facilities. Responses to EPA's Detailed Questionnaire indicate that 68 in-scope landfills collect floor washings at a median daily flow of 985 gallons per day. In 1992, in-scope landfills in the U.S. generated approximately 45 million gallons of floor washings. Of this, approximately 6.4 million gallons were treated on site, 3.3 million gallons were sent untreated to POTWs, and 35 million gallons were treated or disposed by other methods, as discussed above.

6.3.2 Pollutant Parameters Analyzed at EPA Sampling Episodes

EPA conducted 19 sampling episodes at 18 landfill facilities. The Agency conducted five episodes at hazardous landfill facilities and 13 at non-hazardous facilities. EPA conducted one-day sampling episodes for the purpose of collecting raw wastewater samples to characterize landfill generated wastewater. Samples collected during the week-long sampling episodes included raw wastewater samples as well as

intermediate and effluent samples to evaluate the entire wastewater treatment system. Chapter 4 discusses these data collection activities in further detail.

Table 6-7 presents the pollutants analyzed at the one-day and week-long sampling episodes. EPA analyzed for a total of 470 pollutants in the raw wastewater, intermediate, and treated effluent waste stream samples, including 232 toxic and nonconventional organic compounds, 69 toxic and nonconventional metals, 4 conventional pollutants, and 165 toxic and nonconventional pollutants including pesticides, herbicides, dioxins, and furans. The list of pollutants analyzed are included under the following analytical methods: method 1613 for dioxins/furans, method 1620 for metals, method 1624 for volatile organics, method 1625 for semivolatile organics, and methods 1656, 1657, and 1658 for pesticides/herbicides, as well as classical wet chemistry methods.

Table 6-8 presents the list of pollutants analyzed at EPA sampling episodes by subcategory and episode number and whether EPA detected the pollutant in the facility's raw wastewater. If EPA did not detect a pollutant at a facility, Table 6-8 lists an ND (non-detect) in the appropriate row. If EPA did detect a pollutant at a facility, Table 6-8 lists a blank, and in cases where EPA did not sample for a pollutant at a facility, Table 6-8 lists a dash.

EPA collected composite samples at the week-long sampling events at episodes 4626, 4667, 4687, 4690, 4721, and 4759, while EPA collected grab samples at the remaining 12 one-day sampling events. The Agency developed a preliminary list of pollutants of interest by eliminating those pollutants that EPA never detected at any facility in a subcategory from the initial list of 470 pollutants. For the Non-Hazardous subcategory, EPA sampling never detected 316 pollutants in the raw wastewater at Subtitle D municipal facilities and 324 pollutants in the raw wastewater at Subtitle D non-municipal facilities. For the Hazardous subcategory, EPA sampling never detected 250 pollutants in the raw wastewater. Therefore, out of the 470 pollutants initially analyzed for, EPA detected 154 pollutants at least once at Subtitle D municipal facilities and 146 pollutants at least once at Subtitle D non-municipal facilities. For the Hazardous

subcategory, EPA detected 220 pollutants at least once at hazardous facilities. Using the editing criteria presented in Chapter 7, the Agency reduced this preliminary list of pollutants of interest to the final list of 32 pollutants of interest for the Non-Hazardous subcategory (32 pollutants of interest for Subtitle D municipal facilities and 9 pollutants of interest for Subtitle D non-municipal facilities) and 63 pollutants of interest for the Hazardous subcategory. Tables 6-9 and 6-10 present the median concentration for the pollutants of interest for both subcategories.

6.3.3 Raw Wastewater Characterization Data

In order to characterize wastewater from the Landfills industry, EPA compiled raw wastewater data from EPA sampling, the Detailed Questionnaire, the Detailed Monitoring Questionnaire, and the Centralized Waste Treatment Industry (CWT) database.

EPA reviewed each data source to determine if the data was representative of landfill generated wastewater. First, EPA selected only those sample points corresponding to raw wastewater. Second, EPA used several criteria to eliminate sampling data not considered representative of raw landfill wastewater. In characterizing landfill raw wastewater, EPA included only sampled wastewater containing at least 85 percent leachate and/or gas condensate. Therefore, EPA eliminated raw wastewater data that consisted mainly of wastewater that is not subject to this rule (e.g., storm water, ground water, or sanitary wastewater). Also, EPA eliminated wastewater data containing industrial process wastewater. This eliminated the possibility of finding pollutants that may not have originated in a landfill.

Next, EPA grouped all data points according to the classification of the landfill, e.g. municipal solid waste, hazardous waste, or Subtitle D non-municipal solid waste. Many facilities provided data from both technical questionnaires (the Detailed Questionnaire and the Detailed Monitoring Questionnaire), and in several instances, EPA conducted sampling at a facility that also provided data in the technical questionnaires. In these cases, EPA combined all data from the facility to obtain a facility average concentration for each pollutant. For each subcategory, EPA gathered the facility averages for all pollutants

into a file called the Raw Wastewater Source File. EPA then calculated the median of the facility average concentrations in the Source File to determine the median raw wastewater concentration for each pollutant in the subcategory. Tables 6-9 and 6-10 present the median values for the Non-Hazardous and Hazardous subcategories, respectively. EPA refers to this file as the Median Raw Wastewater Concentration File. Tables 6-11 through 6-13 present, by subcategory, the minimum and maximum of the facility average concentrations in the Raw Wastewater Source File, along with the number of observations and number of non-detect values. Note that although EPA included CERCLA data in the characterization of hazardous landfill leachate for the proposal, EPA did not include CERCLA data for raw wastewater characterization for the final rule. The CERCLA data consists primarily of contaminated ground water and, since contaminated ground water is not subject to the regulations, EPA determined that CERCLA data should not be used for hazardous landfill wastewater characterization. Therefore, the raw wastewater characterization data for the Hazardous subcategory presented in Tables 6-11 through 6-13 do not include CERCLA data.

6.3.4 Conventional, Toxic, and Selected Nonconventional Pollutant Parameters

The Clean Water Act defines different types of pollutant parameters used to characterize raw wastewater. These parameters include conventional, nonconventional, and toxic pollutants. Conventional pollutants found in landfill generated wastewater include the following:

- Total Suspended Solids (TSS)
- 5-day Biochemical Oxygen Demand (BOD_5)
- pH
- Oil and Grease (measured as Hexane Extractable Material)

Total solids in wastewater are defined as the residue remaining upon evaporation of the liquid at just above its boiling point. TSS is the portion of the total solids that can be filtered out of solution using a 1 micron filter. Raw wastewater TSS in leachate is a function of the type and form of wastes accepted for disposal

at landfill facilities. Landfill design and operational parameters such as depth of fill, compaction, and capping also influence the concentration of TSS. BOD_5 is one of the most important gauges of pollution potential of a wastewater and varies with the amount of biodegradable matter that can be assimilated by biological organisms under aerobic conditions. The nature of the chemicals contained in landfill generated wastewater affects the BOD_5 due to the differences in susceptibility of different molecular structures to microbiological degradation. Landfill generated wastewater containing compounds with lower susceptibility to decomposition by microorganisms tends to exhibit lower BOD_5 values, even though the total organic loading may be much higher when compared to wastewater exhibiting substantially higher BOD_5 values. For example, a landfill generated wastewater may have a low BOD_5 value while, at the same time, exhibiting a high TOC or COD concentration. Raw wastewater BOD_5 values can vary depending on the waste deposited in the landfill and the landfill age, as noted previously in Section 6.3.1.1.

The pH of a solution is a unitless measurement which represents the acidity or alkalinity of a wastewater stream (or aqueous solution) based on the disassociation of the acid or base in the solution into hydrogen (H^+) or hydroxide (OH^-) ions, respectively. Raw wastewater pH can be a function of the waste deposited in a landfill but can vary depending on the conditions within the landfill, as noted previously in Section 6.3.1.1. Fluctuations in pH are controlled readily by equalization followed by neutralization. Control of pH is necessary to achieve proper removal of pollutants in treatment systems such as metals precipitation and biological treatment systems.

Oil and grease also may be present in selected landfill generated wastewater. Proper control of oil and grease is important because it can interfere with the operation of certain wastewater treatment system processes such as chemical precipitation and the settling operations in biological systems. If it is not removed prior to discharge, excessive levels of oil and grease can interfere with the operation of POTWs and can create a film along surface waters, disrupting the biological activities in those waterways.

Table 6-11 presents the minimum and maximum facility average concentration data for TSS, BOD_5, and oil and grease for each landfill subcategory and the minimum and maximum facility average values for pH. EPA obtained the minimum and maximum values presented for each pollutant in the table from the Raw Wastewater Source File for both subcategories. The Source File contains many pollutants which EPA detected at least once in a subcategory but were not necessarily selected as pollutants of interest. EPA discusses the selection of pollutants of interest in Chapter 7.

EPA also used certain classical nonconventional pollutants for the purposes of raw wastewater characterization. These pollutant parameters include the following: ammonia as nitrogen, nitrate/nitrite, total dissolved solids, total organic carbon, total phenols, chemical oxygen demand, amenable cyanide, and total phosphorus. All of these pollutants are pollutants of interest for either the Non-Hazardous or Hazardous subcategory, with the exception of total phosphorus. For the purposes of presenting raw wastewater characterization data, EPA included these nonconventional pollutants with the conventional pollutants for each landfill subcategory in Table 6-11.

6.3.5 Toxic Pollutants and Remaining Nonconventional Pollutants

Table 6-12 presents the minimum and maximum facility-average concentration data for metals and toxic pollutants for the Non-Hazardous and Hazardous subcategories. EPA obtained the minimum and maximum values presented for each pollutant in the table from the Raw Wastewater Source File for both subcategories. Most of the pollutants included in Table 6-12 are pollutants of interest for either the Non-Hazardous or Hazardous subcategory. EPA detected a wide range of metals in raw wastewater from landfill facilities in both subcategories including both toxic pollutant and nonconventional pollutant metals.

Table 6-13 presents the minimum and maximum facility average concentration data for organic toxic and nonconventional pollutants for the two subcategories. EPA obtained the minimum and maximum values presented for each pollutant in the table from the Raw Wastewater Source File for both subcategories. All pollutants included in Table 6-13 are pollutants of interest for either the Non-Hazardous or Hazardous

subcategory. EPA detected a wide range of organic pollutants in raw wastewater at landfill facilities in both subcategories. Many of these are common organic pollutants found in municipal or commercial waste.

6.3.6 Raw Wastewater at Subtitle D Non-Hazardous Landfills

6.3.6.1 Raw Wastewater at Subtitle D Municipal Landfills

Raw wastewater generated at Subtitle D municipal landfills contained a range of conventional, toxic, and nonconventional pollutants. This wastewater also contained significant concentrations of common nonconventional metals such as iron, magnesium, and manganese. These metals are naturally occurring elements found in raw water, and the presence of these metals in landfill raw wastewater can be attributed to background levels in the water source used at the facility. Generally, toxic heavy metals were found at relatively low concentrations. EPA did not find toxic metals such as arsenic, cadmium, mercury, and lead at treatable levels in any of EPA's sampling episodes. Typical organic pollutants found in leachate included 2-butanone (methyl ethyl ketone) and 2-propanone (acetone), which are common solvents used in household products (such as paints and nail polish), and common industrial solvents such 4-methyl-2-pentanone and 1,4-dioxane. EPA detected only trace concentrations of only two pesticides (dichloroprop and disulfoton) in wastewater from municipal landfills. Additionally, EPA's data showed high loads of organic acids such as benzoic acid and hexanoic acid resulting from anaerobic decomposition of solid waste.

EPA identified 32 pollutants of interest for Subtitle D municipal landfills, including the following: eight conventional/nonconventional pollutants, six metals, 16 organics and pesticides/herbicides, and two dioxins/furans. In the Agency's sampling episodes, EPA never detected 316 pollutants, while approximately 122 pollutants were detected but were not present above the minimum level.

6.3.6.2 Raw Wastewater at Subtitle D Non-Municipal Landfills

A subset of the Subtitle D Non-Hazardous landfill subcategory is the Subtitle D non-municipal landfill.

These types of landfills do not accept municipal solid waste or household refuse. Rather, these facilities accept a number of different types of non-hazardous, non-municipal solid wastes. Waste types accepted at Subtitle D non-municipal facilities include, but are not limited to, municipal incinerator ash, industrial non-hazardous wastes and sludges, wastewater treatment plant sludge, yard waste, and construction and demolition wastes.

EPA identified 9 pollutants of interest for Subtitle D non-municipal landfills, including the following: eight conventional/nonconventional pollutants and one metal. In the Agency's sampling episodes, EPA never detected 324 pollutants, while 136 pollutants were detected but were not present above the minimum level.

Many Subtitle D non-municipal facilities accept two or more of the non-municipal waste types discussed above. Certain facilities accept only one type of waste and are referred to as "monofills". EPA performed an analysis to determine if significant differences existed in raw wastewater characteristics from Subtitle D municipal landfills and these monofill facilities. As discussed in Chapter 5, Section 5.3.1, EPA analyzed characterization data collected at municipal solid waste landfills and monofills as part of EPA's sampling program and analyzed data from several published reports, including prior EPA studies, analyzing construction and demolition monofills, ash monofills, and co-disposal sites. EPA evaluated these data to identify any pollutants found at significant concentrations in monofills that were not found in Subtitle D municipal landfills.

Based on a review of these data sources, EPA observed that the pollutants present in raw wastewater from monofills were not significantly different from those found in Subtitle D municipal landfills, and, in fact, pollutants present in monofills were a subset of those pollutants found at municipal solid waste landfills. In addition, concentrations of virtually all pollutants found in ash, sludge, and construction and demolition waste monofills were significantly lower than those found in raw wastewater from Subtitle D municipal landfills (see Chapter 5, Tables 5-3 and 5-4). EPA acknowledges that there were no organic pollutants of interest detected at Subtitle D non-municipal landfills, and that some monofills, such as ash monofills, may

have a low organic content and, therefore, may not be able to use the selected BPT/BAT treatment technology (biological treatment) to treat the wastewater. However, EPA concluded that these Subtitle D non-municipal facilities can meet the BPT/BAT limitations using available technologies. These treatment systems may be installed at costs comparable to those for biological treatment. As discussed in Chapter 11, EPA established equivalent effluent limitations for all Subtitle D non-hazardous landfills.

6.3.6.3 Dioxins and Furans in Raw Wastewater at Subtitle D Non-Hazardous Landfills

There are 210 isomers of chlorinated dibenzo-p-dioxins (CDD) and chlorinated dibenzofurans (CDF). EPA is primarily concerned with the 2,3,7,8-substituted congeners, of which EPA considers 2,3,7,8-TCDD to be the most toxic and is the only one that is a toxic pollutant. EPA considers non- 2,3,7,8-substituted congeners to be less toxic, in part, because they are not readily absorbed by living organisms. Dioxins and furans may be formed as by-products in certain industrial unit operations related to petroleum refining, pesticide and herbicide production, paper bleaching, and production of materials involving chlorinated compounds. Dioxins and furans are not water-soluble and are not expected to leach out of non-hazardous landfills in significant quantities.

As part of EPA sampling episodes at 13 non-hazardous landfills, EPA analyzed raw wastewater samples for 17 congeners of dioxins and furans. Table 6-14 presents the results of the data analyses. EPA also used additional raw leachate data from ash monofills from previous EPA studies, as discussed in Chapter 5, Section 5.3.1. EPA found low levels of OCDD, HpCDD, and HxCDD in raw wastewater at several landfills. The Agency did not detect the most toxic dioxin congener, 2,3,7,8-TCDD, in raw wastewater at a Subtitle D landfills. All concentrations of dioxins and furans in raw, untreated wastewater were well below the Universal Treatment Standards for F039 wastes (multi-source leachate) in 40 CFR 268.48, which establish minimum concentration standards based on based on the Best Demonstrated Available Treatment Technology (BDAT)[1]. At the concentrations found in raw landfill wastewater, EPA expects

[1] EPA bases UTS on the BDAT for each listed hazardous waste. BDAT represents the treatment technology that EPA concludes is the most effective for treating a particular waste that is also readily available to generators and treaters.

dioxins and furans to partition to the biological sludge as part of the BPT/BAT treatment technologies. EPA included the partitioning of dioxins and furans to the sludge in the evaluation of treatment benefits and water quality impacts. EPA sampling data and calculations conclude that the concentrations of dioxins and furans present in the wastewater would not prevent the sludge from being redeposited in a non-hazardous landfill.

6.3.7 Raw Wastewater at Subtitle C Hazardous Landfills

The Agency used data from EPA sampling episodes and industry supplied data obtained through the technical questionnaires to characterize raw wastewater from Subtitle C hazardous landfills. Wastewater generated at Subtitle C landfills contained a wide range of conventional, toxic, and nonconventional pollutants at treatable levels. There were a significantly greater number of pollutants found in hazardous landfill raw wastewater in comparison to non-hazardous landfills. Pollutants which were common to both untreated non-hazardous and hazardous wastewater were generally an order of magnitude higher in concentration in hazardous landfill wastewater. The list of pollutants of interest for the Hazardous subcategory (presented in Table 6-10), which includes 63 parameters, reflects the more toxic nature of hazardous landfill wastewater and the wide range of industrial waste sources. Chapter 7 discusses the methodology for determining pollutants of interest. For further discussion on the differences between hazardous and non-hazardous landfill leachate, see Chapter 5, Section 5.3.1.

Pollutants typical of raw leachate from hazardous facilities and found at higher median concentrations than at Subtitle D facilities included arsenic, chromium, copper, nickel, and zinc. EPA did not detect cadmium, lead, and mercury at treatable concentrations in the raw wastewater for any of the hazardous landfills sampled during EPA sampling episodes.

EPA identified a total of 63 pollutants of interest for Subtitle C hazardous landfills, including the following: 11 conventional/nonconventional pollutants, 11 metals, 37 organics and pesticides/herbicides, and 4 dioxins/furans. EPA sampling episodes never detected 250 pollutants, while approximately 157 pollutants were detected but were not present above the minimum level.

6.3.7.1 Dioxins and Furans in Raw Wastewater at Subtitle C Hazardous Landfills

As part of EPA sampling episodes at two in-scope Subtitle C landfills and two in-scope pre-1980 industrial landfills, EPA analyzed raw leachate samples for 17 congeners of dioxins and furans. Table 6-15 presents the results of these analyses. As in the Non-Hazardous subcategory, EPA did not detect the most toxic dioxin congener, 2,3,7,8-TCDD, at any in-scope hazardous/industrial landfill. EPA found low levels of several congeners in raw wastewater at many of the sampled landfills. Low levels of OCDD, OCDF, HpCDD, and HpCDF were detected in over half of the landfills sampled. However, all concentrations of dioxins and furans in raw, untreated wastewater were well below the Universal Treatment Standards (UTS) for F039 wastes (multi-source leachate) in 40 CFR 268.48, which establish minimum concentration standards based on BDAT. At the concentrations found in raw landfill wastewater, EPA expects dioxins and furans to partition to the biological sludge as part of the BPT/BAT treatment technologies.

Table 6-1: Wastewater Generated in 1992: Hazardous Subcategory (gallons)

Discharge Type	Wastewater Type	Treated On-Site	Treated Off-Site	Untreated to POTW	Untreated to Surface Water	Recycled Flow	Other
Indirect	Leachate	37,600,000	0	0	0	0	0
	Gas Condensate	772,000	0	0	0	0	0
	Truck/Equipment Washwater	1,220,000	0	101,000	0	0	0
	Floor Washings	706,000	0	0	0	0	0
	Storm Water	0	0	4,740,000	294,000,000	0	0
	Total Indirect	40,298,000	0	4,841,000	294,000,000	0	0
Zero	Leachate	18,100,000	20,600,000	0	0	0	169,000,000
	Gas Condensate	8,390,000	0	0	0	0	0
	Drained Free Liquids	0	0	0	0	0	47,000
	Truck/Equipment Washwater	28,400	513,000	0	0	0	50,300,000
	Floor Washings	0	0	0	0	0	35,000,000
	Contaminated Ground Water	28,700,000	0	0	0	0	0
	Storm Water	0	2,300,000	30,700,000	662,000,000	0	0
	Total Zero	55,218,400	23,413,000	30,700,000	662,000,000	0	254,347,000
Subcategory Total		95,516,400	23,413,000	35,541,000	956,000,000	0	254,347,000

Table 6-2: Wastewater Generated in 1992: Non-Hazardous Subcategory Municipal Facilities (gallons)

Discharge Type	Wastewater Type	Treated On-Site	Treated Off-Site	Untreated to POTW	Untreated to Surface Water	Recycled Flow	Other
Direct	Leachate	565,000,000	782,000	804,000	167,000,000	49,000	94,400,000
	Gas Condensate	1,570,000	0	0	0	0	0
	Drained Free Liquids	715	0	0	0	0	0
	Truck/Equipment Washwater	15,300,000	0	0	0	0	0
	Floor Washings	4,890,000	0	0	0	0	0
	Contaminated Ground Water	163,000,000	0	0	0	0	0
	Storm Water	348,000,000	0	0	3,430,000,000	0	0
	Total Direct	1,097,760,715	782,000	804,000	3,597,000,000	49,000	94,400,000
Indirect	Leachate	777,000,000	7,640,000	3,640,000,000	0	29,800,000	5,870,000
	Gas Condensate	9,700,000	65,900	793,000	0	0	19,700
	Truck/Equipment Washwater	20,700,000	0	9,060,000	594,000	0	0
	Floor Washings	794,000	0	3,320,000	0	0	0
	Contaminated Ground Water	226,000,000	0	0	0	0	0
	Storm Water	3,710,000,000	0	677,000,000	3,890,000,000	85,400,000	1,060,000,000

Table 6-2: Wastewater Generated in 1992: Non-Hazardous Subcategory Municipal Facilities (gallons) (cont'd)

Discharge Type	Wastewater Type	Treated On-Site	Treated Off-Site	Untreated to POTW	Untreated to Surface Water	Recycled Flow	Other
Indirect	Total Indirect	4,744,194,000	7,705,900	4,330,173,000	3,890,594,000	115,200,000	1,065,889,700
Zero	Leachate	170,000,000	561,000,000	0	0	233,000,000	88,600,000
	Gas Condensate	0	1,610,000	0	0	0	0
	Truck/Equipment Washwater	425,000	0	0	0	177,000	2,990,000
	Contaminated Ground Water	296,000,000	0	0	0	0	0
	Storm Water	3,930,000	0	0	137,000,000	212,000,000	24,700,000
	Total Zero	470,355,000	562,610,000	0	137,000,000	445,177,000	116,290,000
Subcategory Total		6,312,309,715	571,097,900	4,330,977,000	7,624,594,000	560,426,000	1,276,579,700

Table 6-3: Wastewater Generated in 1992: Non-Hazardous Subcategory Non-Municipal Facilities (gallons)

Discharge Type	Wastewater Type	Treated On-Site	Treated Off-Site	Untreated to POTW	Untreated to Surface Water	Recycled Flow	Other
Direct	Leachate	0	0	0	250,000,000	0	0
	Storm Water	0	0	0	4,900,000	0	0
	Total Direct	0	0	0	254,900,000	0	0
Indirect	Leachate	47,400,000	0	57,000,000	0	85,100,000	0
	Contaminated Ground Water	0	0	4,120,000	0	0	0
	Storm Water	19,800,000	0	0	0	0	43,100,000
	Total Indirect	67,200,000	0	61,120,000	0	85,100,000	43,100,000
Zero	Leachate	56,700	129,000,000	0	0	0	0
	Truck/Equipment Washwater	2,000	0	0	0	0	0
	Total Zero	58,700	129,000,000	0	0	0	0
Subcategory Total		67,258,700	129,000,000	61,120,000	254,900,000	85,100,000	43,100,000

Table 6-4: Quantity of In-Scope Wastewater Generated in 1992 (gallons)

Discharge Status	Subcategory					Total Wastewater Generated	Total Number of Facilities
	Non-Hazardous			Hazardous			
	Subtitle D Municipal	Subtitle D Non-Municipal	Subtitle D Facilities	Subtitle C	Subtitle C Facilities		
Direct	849,679,000	249,659,000	143	0	0	1,099,338,000	143
Indirect	4,509,255,000	189,511,000	756	40,361,000	6	4,739,127,000	762
Zero	1,058,156,000	128,633,000	338	302,112,000	139	1,488,901,000	477
Total	6,417,090,000	567,803,000	1,237	342,473,000	145	7,327,366,000	1,382

Table 6-5: Contaminant Concentration Ranges in Municipal Leachate as Reported in Literature Sources

Pollutant Parameter	George (1972)	Chain/DeWalle (1977)	Metry/Cross (1977)	Cameron (1978)	Wisconsin Report (20 Sites)	Sobotka Report (44 Sites)
Conventional						
BOD	9 - 54,610	81 - 33,360	2,200 - 720,000	9 - 55,000	ND - 195,000	7 - 21,600
pH	3.7 - 8.5	3.7 - 8.5	3.7 - 8.5	3.7 - 8.5	5 - 8.9	5.4 - 8.0
TSS	6 - 2,685	10 - 700	13 - 26,500		2 - 140,900	28 - 2,835
Non-Conventional						
Alkalinity	0 - 20,850	0 - 20,850	310 - 9,500	0 - 20,900	ND - 15,050	0 - 7,375
Bicarbonate			3,260 - 5,730			
Chlorides	34 - 2,800	4.7 - 2,467	47 - 2,350	34 - 2,800	2 - 11,375	120 - 5,475
COD	0 - 89,520	40 - 89,520	800 - 750,000	0 - 9,000	6.6 - 97,900	440 - 50,450
Fluorides				0 - 2.13	0 - 0.74	0.12 - 0.790
Hardness	0 - 22,800	0 - 22,800	35 - 8,700	0 - 22,800	52 - 225,000	0.8 - 9,380
NH3-Nitrogen	0 - 1,106	0 - 1,106	0.2 - 845	0 - 1,106		11.3 - 1,200
NO3-Nitrogen	0 - 1,300	0.2 - 1,0.29	4.5 - 18			0 - 5,0.95
Organic Nitrogen			2.4 - 550			4.5 - 78.2
Ortho-Phosphorus		6.5 - 85	0.3 - 136	0 - 154		
Sulfates	1 - 1,826	1 - 1,558	20 - 1,370	0 - 1,826	ND - 1,850	8 - 500
Sulfide				0 - 0.13		
TOC		256 - 28,000			ND - 30,500	5 - 6,884
TDS	0 - 42,276	584 - 44,900	100 - 51,000	0 - 42,300	584 - 50,430	1,400 - 16,120
Total-K-Nitrogen	0 - 1,416				2 - 3,320	47.3 - 938
Total Phosphorus	1 - 154	0 - 130			ND - 234	
Total Solids		0 - 59,200				1,900 - 25,873
Metals						
Aluminum				0 - 122	ND - 85	0.010 - 5.07
Arsenic				0 - 11.6	ND - 70.2	0 - 0.08
Barium				0 - 5.4	ND - 12.5	0.01 - 10
Beryllium				0 - 0.3	ND - 0.36	0.001 - 0.01
Boron				0.3 - 73	0.867 - 13	
Cadmium		0.03 - 17		0 - 0.19	ND - 0.04	0 - 0.1
Calcium	5 - 4,080	60 - 7,200	240 - 2,570	5 - 4,000	200 - 2,500	95.5 - 2,100
Total Chromium				0 - 33.4	ND - 5.6	0.001 - 1.0
Copper	0 - 9.9	0 - 9.9		0 - 10	ND - 4.06	0.003 - 0.32
Cyanide				0 - 0.11	ND - 6	0 - 4.0
Iron	0.2 - 5,500	0 - 2,820	0.12 - 1,700	0.2 - 5,500	ND - 1,500	0.22 - 1,400
Lead	0 - 0.5	<0.10 - 2.0		0 - 5.0	0 - 14.2	0.001 - 1.11
Magnesium	16.5 - 15,600	17 - 15,600	64 - 547	16.5 - 15,600	ND - 780	76 - 927
Manganese	0.06 - 1,400	0.09 - 125	13	0.06 - 1,400	ND - 31.1	0.03 - 43
Mercury				0 - 0.064	ND - 0.01	0 - 0.02
Molybendum				0 - 0.52	0.01 - 1.43	
Nickel				0.01 - 0.8	ND - 7.5	0.01 - 1.25
Potassium	2.8 - 3,770	28 - 3,770	28 - 3,800	2.8 - 3,770	ND - 2,800	30 - 1,375
Sodium	0 - 7,700	0 - 7,700	85 - 3,800	0 - 7,700	12 - 6,010	
Titanium				0 - 5.0	<0.01	
Vanadium				0 - 1.4	0.01	
Zinc	0 - 1,000	0 - 370	0.03 - 135	0 - 1,000	ND - 731	0.01 - 67

All concentrations in mg/L, except pH (std units).
ND = Non-detect

Table 6-6: Landfill Gas Condensate (from Detailed Questionnaire)

QID	Pollutant	# Obs	# ND	Avg. Conc.	Unit
16012	**Conventional**				
	Oil & Grease	1	0	422	mg/L
	Metals				
	Arsenic	1	0	570	ug/L
16015	**Organics**				
	1,2-Benzenedicarboxylic Acid, Diethyl Ester	3	1	2.0	mg/L
	1,3-Butadiene, 1,1,2,3,4,4-Hexachloro-	3	1	2.2	mg/L
	1,3-Dichlorobenzene	3	1	1.2	mg/L
	1,4-Dichlorobenzene	3	1	2.0	mg/L
	2,4,6-Trichlorophenol	3	2	15.0	mg/L
	2,4-Dichlorophenol	3	2	15.0	mg/L
	2,4-Dimethylphenol	3	2	17.3	mg/L
	2,6-Dinitrotoluene	3	2	5.83	mg/L
	2-Methyl-4,6-Dinitrophenol	3	0	100	mg/L
	2-Nitrophenol	3	2	17.5	mg/L
	3,4-Benzopyrene	3	2	2.0	mg/L
	3-Methyl-4-Chlorophenol	3	1	20.0	mg/L
	Benz(E)Acephenenthrylene	3	2	2.33	mg/L
	Benzenamine, 4-Nitro-	3	1	2.2	mg/L
	Benzene, Nitro-	3	2	4.3	mg/L
	Benzene Hexachloride	3	1	2.3	mg/L
	Benzene, Ethyl-	3	2	3.4	mg/L
	Benzene, Methyl-	3	2	2.6	mg/L
	Benzo(Def)Phenanthrene	3	1	2.2	mg/L
	Bis(2-Chloroethoxy)Methane	3	2	2.8	mg/L
	Chloroform	3	2	3.9	mg/L
	Di-n-propyl Nitrosamine	3	0	3.3	mg/L
	Ethene, Trichloro	3	2	2.5	mg/L
	Ethene, Tetrachloro-	3	1	10.6	mg/L
	O-Chlorophenol	3	2	8.7	mg/L
	Residue, Non-flammable	3	0	27.2	mg/L
	Metals				
	Gold	3	1	0.04	mg/L
	Lead	3	2	0.13	mg/L
	Zinc	3	0	0.14	mg/L

16012: Treated effluent after hydrocarbon/aqueous phase separation and caustic neutralization.
16015: Treated effluent after equalization, caustic neutralization, and carbon adsorption.
QID: Questionnaire ID number
Obs: Number of observations
ND: Number of non-detects

Table 6-7: EPA Sampling Episode Pollutants Analyzed

POLLUTANT	CAS NUM
CLASSSICAL WET CHEMISTRY	
AMENABLE CYANIDE	C-025
AMMONIA NITROGEN	7664-41-7
BOD	C-002
CHLORIDE	16887-00-6
COD	C-004
FLUORIDE	16984-48-8
HEXANE EXTRACTABLE MATERIAL	C-036
HEXAVALENT CHROMIUM	18540-29-9
NITRATE/NITRITE	C-005
PH	C-006
RECOVERABLE OIL AND GREASE	C-007
TDS	C-010
TOC	C-012
TOTAL CYANIDE	57-12-5
TOTAL PHENOLS	C-020
TOTAL PHOSPHORUS	14265-44-2
TOTAL SOLIDS	C-008
TOTAL SULFIDE	18496-25-8
TSS	C-009
1613: DIOXINS/FURANS	
2378-TCDD	1746-01-6
2378-TCDF	51207-31-9
12378-PECDD	40321-76-4
12378-PECDF	57117-41-6
23478-PECDF	57117-31-4
123478-HXCDD	39227-28-6
123678-HXCDD	57653-85-7
123789-HXCDD	19408-74-3
123478-HXCDF	70648-26-9
123678-HXCDF	57117-44-9
123789-HXCDF	72918-21-9
234678-HXCDF	60851-34-5
1234678-HPCDD	35822-46-9
1234678-HPCDF	67562-39-4
1234789-HPCDF	55673-89-7
OCDD	3268-87-9
OCDF	39001-02-0
1657: PESTICIDES/HERBICIDES	
AZINPHOS ETHYL	2642-71-9
AZINPHOS METHYL	86-50-0
CHLORFEVINPHOS	470-90-6
CHLORPYRIFOS	2921-88-2
COUMAPHOS	56-72-4
CROTOXYPHOS	7700-17-6
DEF	78-48-8
DEMETON A	8065-48-3A
DEMETON B	8065-48-3B
DIAZINON	333-41-5
DICHLORFENTHION	97-17-6
DICHLORVOS	62-73-7
DICROTOPHOS	141-66-2
DIMETHOATE	60-51-5
DIOXATHION	78-34-2
DISULFOTON	298-04-4
EPN	2104-64-5
ETHION	563-12-2
ETHOPROP	13194-48-8
FAMPHUR	52-85-7
FENSULFOTHION	115-90-2
FENTHION	55-38-9
HEXAMETHYLPHOSPHORAMIDE	680-31-9
LEPTOPHOS	21609-90-5
MALATHION	121-75-5
MERPHOS	150-50-5

POLLUTANT	CAS NUM
1657: PESTICIDES/HERBICIDES	
METHAMIDOPHOS	10265-92-6
METHYL CHLORPYRIFOS	5598-13-0
METHYL PARATHION	298-00-0
METHYL TRITHION	953-17-3
MEVINPHOS	7786-34-7
MONOCROTOPHOS	6923-22-4
NALED	300-76-5
PARATHION (ETHYL)	56-38-2
PHORATE	298-02-2
PHOSMET	732-11-6
PHOSPHAMIDON E	297-99-4
PHOSPHAMIDON Z	23783-98-4
RONNEL	299-84-3
SULFOTEPP	3689-24-5
SULPROFOS	35400-43-2
TEPP	107-49-3
TERBUFOS	13071-79-9
TETRACHLORVINPHOS	22248-79-9
TOKUTHION	34643-46-4
TRICHLORFON	52-68-6
TRICHLORONATE	327-98-0
TRICRESYLPHOSPHATE	78-30-8
TRIMETHYLPHOSPHATE	512-56-1
1656: PESTICIDES/HERBICIDES	
ACEPHATE	30560-19-1
ACIFLUORFEN	50594-66-6
ALACHLOR	15972-60-8
ALDRIN	309-00-2
ATRAZINE	1912-24-9
BENFLURALIN	1861-40-1
ALPHA-BHC	319-84-6
BETA-BHC	319-85-7
GAMMA-BHC	58-89-9
DELTA-BHC	319-86-8
BROMACIL	314-40-9
BROMOXYNILOCTANOATE	1689-99-2
BUTACHLOR	23184-66-9
CAPTAFOL	2425-06-1
CAPTAN	133-06-2
CARBOPHENOTHION	786-19-6
ALPHA-CHLORDANE	5103-71-9
GAMMA-CHLORDANE	5103-74-2
CHLOROBENZILATE	510-15-6
CHLORONEB	2675-77-6
CHLOROPROPYLATE	5836-10-2
CHLOROTHALONIL	1897-45-6
DIBROMOCHLOROPROPANE	96-12-8
DACTHAL (DCPA)	1861-32-1
4,4'-DDD	72-54-8
4,4'-DDE	72-55-9
4,4'-DDT	50-29-3
DIALLATE A	2303-16-4A
DIALLATE B	2303-16-4B
DICHLONE	117-80-6
DICOFOL	115-32-2
DIELDRIN	60-57-1
ENDOSULFAN I	959-98-8
ENDOSULFAN II	33213-65-9
ENDOSULFAN SULFATE	1031-07-8
ENDRIN	72-20-8
ENDRIN ALDEHYDE	7421-93-4
ENDRIN KETONE	53494-70-5
ETHALFLURALIN	55283-68-6
ETRADIAZOLE	2593-15-9

Table 6-7: EPA Sampling Episode Pollutants Analyzed (continued)

POLLUTANT	CAS NUM
1656: PESTICIDES/HERBICIDES	
FENARIMOL	60168-88-9
HEPTACHLOR	76-44-8
HEPTACHLOR EPOXIDE	1024-57-3
ISODRIN	465-73-6
ISOPROPALIN	33820-53-0
KEPONE	143-50-0
METHOXYCHLOR	72-43-5
METRIBUZIN	21087-64-9
MIREX	2385-85-5
NITROFEN	1836-75-5
NORFLUORAZON	27314-13-2
PCB-1016	12674-11-2
PCB-1221	11104-28-2
PCB-1232	11141-16-5
PCB-1242	53469-21-9
PCB-1248	12672-29-6
PCB-1254	11097-69-1
PCB-1260	11096-82-5
PENTACHLORONITROBENZENE	82-68-8
PENDAMETHALIN	40487-42-1
CIS-PERMETHRIN	61949-76-6
TRANS-PERMETHRIN	61949-77-7
PERTHANE	72-56-0
PROPACHLOR	1918-16-7
PROPANIL	709-98-8
PROPAZINE	139-40-2
SIMAZINE	122-34-9
STROBANE	8001-50-1
TERBACIL	5902-51-2
TERBUTHYLAZINE	5915-41-3
TOXAPHENE	8001-35-2
TRIADIMEFON	43121-43-3
TRIFLURALIN	1582-09-8
1658: PESTICIDES/HERBICIDES	
DALAPON	75-99-0
DICAMBA	1918-00-9
DICHLOROPROP	120-36-5
DINOSEB	88-85-7
MCPA	94-74-6
MCPP	7085-19-0
PICLORAM	1918-02-1
2,4-D	94-75-7
2,4-DB	94-82-6
2,4,5-T	93-76-5
2,4,5-TP	93-72-1
1620: METALS	
ALUMINUM	7429-90-5
ANTIMONY	7440-36-0
ARSENIC	7440-38-2
BARIUM	7440-39-3
BERYLLIUM	7440-41-7
BISMUTH	7440-69-9
BORON	7440-42-8
CADMIUM	7440-43-9
CALCIUM	7440-70-2
CERIUM	7440-45-1
CHROMIUM	7440-47-3
COBALT	7440-48-4
COPPER	7440-50-8
DYSPROSIUM	7429-91-6
ERBIUM	7440-52-0
EUROPIUM	7440-53-1
GADOLINIUM	7440-54-2
GALLIUM	7440-55-3

POLLUTANT	CAS NUM
1620: METALS	
GERMANIUM	7440-56-4
GOLD	7440-57-5
HAFNIUM	7440-58-6
HOLMIUM	7440-60-0
INDIUM	7440-74-6
IODINE	7553-56-2
IRIDIUM	7439-88-5
IRON	7439-89-6
LANTHANUM	7439-91-0
LEAD	7439-92-1
LITHIUM	7439-93-2
LUTETIUM	7439-94-3
MAGNESIUM	7439-95-4
MANGANESE	7439-96-5
MERCURY	7439-97-6
MOLYBDENUM	7439-98-7
NEODYMIUM	7440-00-8
NICKEL	7440-02-0
NIOBIUM	7440-03-1
OSMIUM	7440-04-2
PALLADIUM	7440-05-3
PHOSPHORUS	7723-14-0
PLATINUM	7440-06-4
POTASSIUM	7440-09-7
PRASEODYMIUM	7440-10-0
RHENIUM	7440-15-5
RHODIUM	7440-16-6
RUTHENIUM	7440-18-8
SAMARIUM	7440-19-9
SCANDIUM	7440-20-2
SELENIUM	7782-49-2
SILICON	7440-21-3
SILVER	7440-22-4
SODIUM	7440-23-5
STRONTIUM	7440-24-6
SULFUR	7704-34-9
TANTALUM	7440-25-7
TELLURIUM	13494-80-9
TERBIUM	7440-27-9
THALLIUM	7440-28-0
THORIUM	7440-29-1
THULIUM	7440-30-4
TIN	7440-31-5
TITANIUM	7440-32-6
TUNGSTEN	7440-33-7
URANIUM	7440-61-1
VANADIUM	7440-62-2
YTTERBIUM	7440-64-4
YTTRIUM	7440-65-5
ZINC	7440-66-6
ZIRCONIUM	7440-67-7
1624: VOLATILE ORGANICS	
1,1-DICHLOROETHANE	75-34-3
1,1-DICHLOROETHENE	75-35-4
1,1,1-TRICHLOROETHANE	71-55-6
1,1,1,2-TETRACHLOROETHANE	630-20-6
1,1,2-TRICHLOROETHANE	79-00-5
1,1,2,2-TETRACHLOROETHANE	79-34-5
1,2-DIBROMOETHANE	106-93-4
1,2-DICHLOROETHANE	107-06-2
1,2-DICHLOROPROPANE	78-87-5
1,2,3-TRICHLOROPROPANE	96-18-4
1,3-DICHLOROPROPANE	142-28-9
1,4-DIOXANE	123-91-1

Table 6-7: EPA Sampling Episode Pollutants Analyzed (continued)

POLLUTANT	CAS NUM
1624: VOLATILE ORGANICS	
2-BUTANONE (MEK)	78-93-3
2-CHLORO-1,3-BUTADIENE	126-99-8
2-CHLOROETHYLVINYL ETHER	110-75-8
2-HEXANONE	591-78-6
2-METHYL-2-PROPENENITRILE	126-98-7
2-PROPANONE (ACETONE)	67-64-1
2-PROPENAL (ACROLEIN)	107-02-8
2-PROPEN-1-OL (ALLYL ALCOHOL)	107-18-6
3-CHLOROPROPENE	107-05-1
4-METHYL-2-PENTANONE	108-10-1
ACRYLONITRILE	107-13-1
BENZENE	71-43-2
BROMODICHLOROMETHANE	75-27-4
BROMOFORM	75-25-2
BROMOMETHANE	74-83-9
CARBON DISULFIDE	75-15-0
CHLOROACETONITRILE	107-14-2
CHLOROBENZENE	108-90-7
CHLOROETHANE	75-00-3
CHLOROFORM	67-66-3
CHLOROMETHANE	74-87-3
CIS-1,3-DICHLOROPROPENE	10061-01-5
CROTONALDEHYDE	4170-30-3
DIBROMOCHLOROMETHANE	124-48-1
DIBROMOMETHANE	74-95-3
DIETHYL ETHER	60-29-7
ETHYL BENZENE	100-41-4
ETHYL CYANIDE	107-12-0
ETHYL METHACRYLATE	97-63-2
IODOMETHANE	74-88-4
ISOBUTYL ALCOHOL	78-83-1
METHYLENE CHLORIDE	75-09-2
M-XYLENE	108-38-3
O+P XYLENE	136777-61-2
TETRACHLOROETHENE	127-18-4
TETRACHLOROMETHANE	56-23-5
TOLUENE	108-88-3
TRANS-1,2-DICHLOROETHENE	156-60-5
TRANS-1,3-DICHLOROPROPENE	10061-02-6
TRANS-1,4-DICHLORO-2-BUTENE	110-57-6
TRICHLOROETHENE	79-01-6
TRICHLOROFLUOROMETHANE	75-69-4
VINYL ACETATE	108-05-4
VINYL CHLORIDE	75-01-4
1625: SEMIVOLATILE ORGANICS	
1-METHYLFLUORENE	1730-37-6
1-METHYLPHENANTHRENE	832-69-9
1-PHENYLNAPHTHALENE	605-02-7
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8
1,2-DICHLOROBENZENE	95-50-1
1,2-DIPHENYLHYDRAZINE	122-66-7
1,2,3-TRICHLOROBENZENE	87-61-6
1,2,3-TRIMETHOXYBENZENE	634-36-6
1,2,4-TRICHLOROBENZENE	120-82-1
1,2,4,5-TETRACHLOROBENZENE	95-94-3
1,2:3,4-DIEPOXYBUTANE	1464-53-5
1,3-BENZENEDIOL (RESORCINOL)	108-46-3
1,3-DICHLORO-2-PROPANOL	96-23-1
1,3-DICHLOROBENZENE	541-73-1
1,3,5-TRITHIANE	291-21-4
1,4-DICHLOROBENZENE	106-46-7
1,4-DINITROBENZENE	100-25-4
1,4-NAPHTHOQUINONE	130-15-4
1,5-NAPHTHALENEDIAMINE	2243-62-1

POLLUTANT	CAS NUM
1625: SEMIVOLATILE ORGANICS	
2-BROMOCHLOROBENZENE	694-80-4
2-CHLORONAPHTHALENE	91-58-7
2-CHLOROPHENOL	95-57-8
2-ISOPROPYLNAPHTHALENE	2027-17-0
2-METHYL-4,6-DINITROPHENOL	534-52-1
2-METHYLBENZOTHIOAZOLE	120-75-2
2-METHYLNAPHTHALENE	91-57-6
2-NITROANILINE	88-74-4
2-NITROPHENOL	88-75-5
2-PHENYLNAPHTHALENE	612-94-2
2-PICOLINE	109-06-8
2-(METHYLTHIO)BENZOTHIAZOLE	615-22-5
2,3-BENZOFLUORENE	243-17-4
2,3-DICHLOROANILINE	608-27-5
2,3-DICHLORONITROBENZENE	3209-22-1
2,3,4,6-TETRACHLOROPHENOL	58-90-2
2,3,6-TRICHLOROPHENOL	933-75-5
2,4-DIAMINOTOLUENE	95-80-7
2,4-DICHLOROPHENOL	120-83-2
2,4-DIMETHYLPHENOL	105-67-9
2,4-DINITROPHENOL	51-28-5
2,4-DINITROTOLUENE	121-14-2
2,4,5-TRICHLOROPHENOL	95-95-4
2,4,5-TRIMETHYLANILINE	137-17-7
2,4,6-TRICHLOROPHENOL	88-06-2
2,6-DICHLORO-4-NITROANILINE	99-30-9
2,6-DICHLOROPHENOL	87-65-0
2,6-DINITROTOLUENE	606-20-2
2,6-DI-TERT-BUTYL-P-BENZOQUINONE	719-22-2
3-BROMOCHLOROBENZENE	108-37-2
3-CHLORONITROBENZENE	121-73-3
3-METHYLCHOLANTHRENE	56-49-5
3-NITROANILINE	99-09-2
3,3-DICHLOROBENZIDINE	91-94-1
3,3'-DIMETHOXYBENZIDINE	119-90-4
3,5-DIBROMO-4-HYDROXYBENZONITRILE	1689-84-5
3,6-DIMETHYLPHENANTHRENE	1576-67-6
4-AMINOBIPHENYL	92-67-1
4-BROMOPHENYL PHENYL ETHER	101-55-3
4-CHLORO-2-NITROANILINE	89-63-4
4-CHLORO-3-METHYLPHENOL	59-50-7
4-CHLOROANILINE	106-47-8
4-CHLOROPHENYL PHENYL ETHER	7005-72-3
4-NITROANILINE	100-01-6
4-NITROBIPHENYL	92-93-3
4-NITROPHENOL	100-02-7
4,4-METHYLENE-BIS(2-CHLOROANILINE)	101-14-4
4,5-METHYLENE-PHENANTHRENE	203-64-5
5-CHLORO-O-TOLUIDINE	95-79-4
5-NITRO-O-TOLUIDINE	99-55-8
7,12-DIMETHYLBENZ(A)ANTHRACENE	57-97-6
ACENAPHTHENE	83-32-9
ACENAPHTHYLENE	208-96-8
ACETOPHENONE	98-86-2
ALPHA-NAPHTHYLAMINE	134-32-7
ALPHA-TERPINEOL	98-55-5
ANILINE	62-53-3
ANTHRACENE	120-12-7
ARAMITE	140-57-8
BENZANTHRONE	82-05-3
BENZENETHIOL	108-98-5
BENZIDINE	92-87-5
BENZOIC ACID	65-85-0
BENZO(A)ANTHRACENE	56-55-3

Table 6-7: EPA Sampling Episode Pollutants Analyzed (continued)

POLLUTANT	CAS NUM	POLLUTANT	CAS NUM
1625: SEMIVOLATILE ORGANICS		1625: SEMIVOLATILE ORGANICS	
BENZO(A)PYRENE	50-32-8	N-NITROSOMORPHOLINE	59-89-2
BENZO(B)FLUORANTHENE	205-99-2	N-NITROSOPIPERIDINE	100-75-4
BENZO(GHI)PERYLENE	191-24-2	N,N-DIMETHYLFORMAMIDE	68-12-2
BENZO(K)FLUORANTHENE	207-08-9	O-ANISIDINE	90-04-0
BENZYL ALCOHOL	100-51-6	O-CRESOL	95-48-7
BETA-NAPHTHYLAMINE	91-59-8	O-TOLUIDINE	95-53-4
BIPHENYL	92-52-4	P-CRESOL	106-44-5
BIS(2-CHLOROETHOXY)METHANE	111-91-1	P-CYMENE	99-87-6
BIS(2-CHLOROETHYL)ETHER	111-44-4	P-DIMETHYLAMINO-AZOBENZENE	60-11-7
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	PENTACHLOROBENZENE	608-93-5
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	PENTACHLOROETHANE	76-01-7
BUTYLBENZYLPHTHALATE	85-68-7	PENTACHLOROPHENOL	87-86-5
CARBAZOLE	86-74-8	PENTAMETHYLBENZENE	700-12-9
CHRYSENE	218-01-9	PERYLENE	198-55-0
CROTOXYPHOS	7700-17-6	PHENACETIN	62-44-2
DIBENZOFURAN	132-64-9	PHENANTHRENE	85-01-8
DIBENZOTHIOPHENE	132-65-0	PHENOL	108-95-2
DIBENZO(A,H)ANTHRACENE	53-70-3	PHENOTHIAZINE	92-84-2
DIETHYLPHTHALATE	84-66-2	PRONAMIDE	23950-58-5
DIMETHYLPHTHALATE	131-11-3	PYRENE	129-00-0
DIMETHYLSULFONE	67-71-0	PYRIDINE	110-86-1
DI-N-BUTYLPHTHALATE	84-74-2	SAFROLE	94-59-7
DI-N-OCTYLPHTHALATE	117-84-0	SQUALENE	7683-64-9
DIPHENYLETHER	101-84-8	STYRENE	100-42-5
DIPHENYLAMINE	122-39-4	THIANAPHTHENE (2,3-BENZOTHIOPHENE)	95-15-8
DIPHENYLDISULFIDE	882-33-7	THIOACETAMIDE	62-55-5
ETHYLMETHANESULFONATE	62-50-0	THIOXANTHONE	492-22-8
ETHYLENETHIOUREA	96-45-7	TRIPHENYLENE	217-59-4
ETHYNYLESTRADIOL-3-METHYLETHER	72-33-3	TRIPROPYLENEGLYCOLMETHYLETHER	20324-33-8
FLUORANTHENE	206-44-0		
FLUORENE	86-73-7		
HEXACHLOROBENZENE	118-74-1		
HEXACHLOROBUTADIENE	87-68-3		
HEXACHLOROCYCLOPENTADIENE	77-47-4		
HEXACHLOROETHANE	67-72-1		
HEXACHLOROPROPENE	1888-71-7		
HEXANOIC ACID	142-62-1		
INDENO(1,2,3-CD)PYRENE	193-39-5		
ISOPHORONE	78-59-1		
ISOSAFROLE	120-58-1		
LONGIFOLENE	475-20-7		
MALACHITE GREEN	569-64-2		
METHAPYRILENE	91-80-5		
METHYLMETHANESULFONATE	66-27-3		
NAPHTHALENE	91-20-3		
N-C10 (N-DECANE)	124-18-5		
N-C12 (N-DODECANE)	112-40-3		
N-C14 (N-TETRADECANE)	629-59-4		
N-C16 (N-HEXADECANE)	544-76-3		
N-C18 (N-OCTADECANE)	593-45-3		
N-C20 (N-EICOSANE)	112-95-8		
N-C22 (N-DOCOSANE)	629-97-0		
N-C24 (N-TETRACOSANE)	646-31-1		
N-C26 (N-HEXACOSANE)	630-01-3		
N-C28 (N-OCTACOSANE)	630-02-4		
N-C30 (N-TRIACONTANE)	638-68-6		
NITROBENZENE	98-95-3		
N-NITROSODIETHYLAMINE	55-18-5		
N-NITROSODIMETHYLAMINE	62-75-9		
N-NITROSODI-N-BUTYLAMINE	924-16-3		
N-NITROSODI-N-PROPYLAMINE	621-64-7		
N-NITROSODIPHENYLAMINE	86-30-6		
N-NITROSOMETHYL-ETHYLAMINE	10595-95-6		
N-NITROSOMETHYL-PHENYLAMINE	614-00-6		

Table 6-8: EPA Sampling Episode List of Analytes Never Detected

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					**Subtitle D Non-Municipal**														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
1613: DIOXINS/FURANS																					
2378-TCDD	1746-01-6	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2378-TCDF	51207-31-9	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
12378-PECDD	40321-76-4	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12378-PECDF	57117-41-6	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
23478-PECDF	57117-31-4	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
123478-HXCDD	39227-28-6	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
123678-HXCDD	57653-85-7	ND	-	-	ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND	ND	ND	ND
123789-HXCDD	19408-74-3	ND	-	-	ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND	ND	ND	ND
123478-HXCDF	70648-26-9	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
123678-HXCDF	57117-44-9	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
123789-HXCDF	72918-21-9	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
234678-HXCDF	60851-34-5	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND
1234678-HPCDD	35822-46-9		-	-	ND		ND		ND	ND	ND	ND	ND		ND		ND	ND			ND
1234678-HPCDF	67562-39-4	ND	-	-	ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND			ND
1234789-HPCDF	55673-89-7	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
OCDD	3268-87-9		-	-	ND		ND		ND	ND	ND	ND	ND				ND	ND			ND
OCDF	39001-02-0	ND	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND			ND
1620: METALS																					
ALUMINUM	7429-90-5									ND	ND	ND	ND				ND				
ANTIMONY	7440-36-0				ND	ND	ND	ND	ND			ND		ND		ND	ND				
ARSENIC	7440-38-2								ND		ND		ND								
BARIUM	7440-39-3																				
BERYLLIUM	7440-41-7	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BISMUTH	7440-69-9	ND		ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BORON	7440-42-8			ND																	
CADMIUM	7440-43-9						ND	ND	ND	ND			ND		ND	ND	ND		ND	ND	
CALCIUM	7440-70-2																				
CERIUM	7440-45-1	ND		ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND	ND	ND
CHROMIUM	7440-47-3				ND		ND	ND	ND		ND	ND	ND				ND		ND		
COBALT	7440-48-4		ND		ND				ND	ND	ND	ND	ND		ND						
COPPER	7440-50-8				ND		ND					ND			ND	ND	ND				
DYSPROSIUM	7429-91-6	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ERBIUM	7440-52-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	
EUROPIUM	7440-53-1	ND			ND	ND	ND	ND	ND				ND	ND	ND	ND	ND	ND	ND	ND	
GADOLINIUM	7440-54-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
GALLIUM	7440-55-3	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GERMANIUM	7440-56-4	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GOLD	7440-57-5	ND		ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HAFNIUM	7440-58-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
HOLMIUM	7440-60-0	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
INDIUM	7440-74-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
IODINE	7553-56-2	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
IRIDIUM	7439-88-5	ND	ND		ND	ND	ND	ND	ND				ND	ND	ND	ND	ND		ND	ND	ND
IRON	7439-89-6																				
LANTHANUM	7439-91-0	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
LEAD	7439-92-1	ND	ND				ND	ND	ND			ND	ND		ND	ND	ND		ND	ND	
LITHIUM	7439-93-2	ND			ND	ND		ND		ND	ND		ND								
LUTETIUM	7439-94-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
MAGNESIUM	7439-95-4																				
MANGANESE	7439-96-5																				
MERCURY	7439-97-6				ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND		
MOLYBDENUM	7439-98-7				ND	ND	ND	ND		ND			ND		ND	ND					
NEODYMIUM	7440-00-8	ND	ND	ND	ND		ND	ND	ND		ND		ND	ND	ND	ND	ND	ND	ND	ND	
NICKEL	7440-02-0									ND	ND	ND	ND								
NIOBIUM	7440-03-1	ND			ND	ND	ND	ND	ND				ND	ND	ND	ND		ND	ND	ND	ND
OSMIUM	7440-04-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PALLADIUM	7440-05-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
PHOSPHORUS	7723-14-0	ND			ND						ND	ND	ND				ND				
PLATINUM	7440-06-4	ND	ND		ND	ND	ND	ND	ND	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND
POTASSIUM	7440-09-7	ND										ND									
PRASEODYMIUM	7440-10-0	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
RHENIUM	7440-15-5	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND	ND	
RHODIUM	7440-16-6	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	
RUTHENIUM	7440-18-8	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
SAMARIUM	7440-19-9	ND	ND	ND	ND	ND	ND	ND	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	
SCANDIUM	7440-20-2	ND			ND	ND	ND	ND	ND				ND	ND	ND	ND	ND	ND	ND	ND	
SELENIUM	7782-49-2	ND			ND	ND	ND	ND			ND	ND	ND	ND	ND		ND				
SILICON	7440-21-3	ND																			
SILVER	7440-22-4	ND	ND		ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SODIUM	7440-23-5																				
STRONTIUM	7440-24-6	ND																			
SULFUR	7704-34-9	ND										ND									
TANTALUM	7440-25-7	ND			ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	
TELLURIUM	13494-80-9	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERBIUM	7440-27-9	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
THALLIUM	7440-28-0	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
THORIUM	7440-29-1	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THULIUM	7440-30-4	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
TIN	7440-31-5	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND			ND	

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
TITANIUM	7440-32-6				ND						ND	ND	ND				ND		ND		
TUNGSTEN	7440-33-7	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
URANIUM	7440-61-1	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
VANADIUM	7440-62-2				ND		ND		ND	ND	ND	ND	ND				ND				
YTTERBIUM	7440-64-4	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
YTTRIUM	7440-65-5			ND			ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
ZINC	7440-66-6											ND									
ZIRCONIUM	7440-67-7	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND	ND	ND	ND	
1624: VOLATILE ORGANICS																					
1,1-DICHLOROETHANE	75-34-3			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				
1,1-DICHLOROETHENE	75-35-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,1,1-TRICHLOROETHANE	71-55-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
1,1,1,2-TETRACHLOROETHANE	630-20-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,1,2-TRICHLOROETHANE	79-00-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,1,2,2-TETRACHLOROETHANE	79-34-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,2-DIBROMOETHANE	106-93-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND				
1,2-DICHLOROPROPANE	78-87-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		ND	ND
1,2,3-TRICHLOROPROPANE	96-18-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
1,3-DICHLOROPROPANE	142-28-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-DIOXANE	123-91-1	ND				ND	ND	ND	ND		ND	ND	ND		ND		ND			ND	
2-BUTANONE (MEK)	78-93-3						ND	ND	ND	ND	ND	ND	ND				ND				
2-CHLORO-1,3-BUTADIENE	126-99-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
2-CHLOROETHYLVINYL ETHER	110-75-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-HEXANONE	591-78-6	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND				ND
2-METHYL-2-PROPENENITRILE	126-98-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
2-PROPANONE (ACETONE)	67-64-1							ND		ND	ND	ND	ND								
2-PROPENAL (ACROLEIN)	107-02-8	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-PROPEN-1-OL (ALLYL ALCOHOL)	107-18-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	ND
3-CHLOROPROPENE	107-05-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-METHYL-2-PENTANONE	108-10-1	ND				ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				
ACRYLONITRILE	107-13-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	71-43-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				
BROMODICHLOROMETHANE	75-27-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BROMOFORM	75-25-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BROMOMETHANE	74-83-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON DISULFIDE	75-15-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND	
CHLOROACETONITRILE	107-14-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
CHLOROBENZENE	108-90-7	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND			ND
CHLOROETHANE	75-00-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND	ND		ND	ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory													Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal													
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
CHLOROFORM	67-66-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
CHLOROMETHANE	74-87-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CIS-1,3-DICHLOROPROPENE	10061-01-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
CROTONALDEHYDE	4170-30-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	124-48-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIBROMOMETHANE	74-95-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIETHYL ETHER	60-29-7	ND		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		ND
ETHYL BENZENE	100-41-4						ND	ND	ND	ND	ND	ND	ND	ND			ND				
ETHYL CYANIDE	107-12-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYL METHACRYLATE	97-63-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
IODOMETHANE	74-88-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ISOBUTYL ALCOHOL	78-83-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND	
METHYLENE CHLORIDE	75-09-2				ND		ND	ND	ND	ND	ND	ND	ND		ND		ND				
M-XYLENE	108-38-3				ND		ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		
O+P XYLENE	136777-61-2				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		ND
TETRACHLOROETHENE	127-18-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				ND
TETRACHLOROMETHANE	56-23-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
TOLUENE	108-88-3								ND	ND	ND	ND	ND	ND			ND				
TRANS-1,2-DICHLOROETHENE	156-60-5	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				ND
TRANS-1,3-DICHLOROPROPENE	10061-02-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRANS-1,4-DICHLORO-2-BUTENE	110-57-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	79-01-6	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND		ND				ND
TRICHLOROFLUOROMETHANE	75-69-4	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VINYL ACETATE	108-05-4	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	75-01-4	ND				ND	ND	ND	ND	ND	ND	ND	ND	ND			ND				ND
1625: SEMIVOLATILE ORGANICS																					
1-METHYLFLUORENE	1730-37-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-METHYLPHENANTHRENE	832-69-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-PHENYLNAPHTHALENE	605-02-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	95-50-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND
1,2-DIPHENYLHYDRAZINE	122-66-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
1,2,3-TRICHLOROBENZENE	87-61-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-TRIMETHOXYBENZENE	634-36-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-TRICHLOROBENZENE	120-82-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4,5-TETRACHLOROBENZENE	95-94-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2:3,4-DIEPOXYBUTANE	1464-53-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-BENZENEDIOL (RESORCINOL)	108-46-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLORO-2-PROPANOL	96-23-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	541-73-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
1,3,5-TRITHIANE	291-21-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND
1,4-DICHLOROBENZENE	106-46-7		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND
1,4-DINITROBENZENE	100-25-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-NAPHTHOQUINONE	130-15-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,5-NAPHTHALENEDIAMINE	2243-62-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-BROMOCHLOROBENZENE	694-80-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-CHLORONAPHTHALENE	91-58-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-CHLOROPHENOL	95-57-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-ISOPROPYLNAPHTHALENE	2027-17-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-METHYL-4,6-DINITROPHENOL	534-52-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
2-METHYLBENZOTHIOAZOLE	120-75-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-METHYLNAPHTHALENE	91-57-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
2-NITROANILINE	88-74-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-NITROPHENOL	88-75-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
2-PHENYLNAPHTHALENE	612-94-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-PICOLINE	109-06-8			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
2-(METHYLTHIO)BENZOTHIAZOLE	615-22-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
2,3-BENZOFLUORENE	243-17-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3-DICHLOROANILINE	608-27-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3-DICHLORONITROBENZENE	3209-22-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-TETRACHLOROPHENOL	58-90-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,6-TRICHLOROPHENOL	933-75-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DIAMINOTOLUENE	95-80-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DICHLOROPHENOL	120-83-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DIMETHYLPHENOL	105-67-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		
2,4-DINITROPHENOL	51-28-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
2,4-DINITROTOLUENE	121-14-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TRICHLOROPHENOL	95-95-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TRIMETHYLANILINE	137-17-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-TRICHLOROPHENOL	88-06-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-DICHLORO-4-NITROANILINE	99-30-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-DICHLOROPHENOL	87-65-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	606-20-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
2,6-DI-TERT-BUTYL-P-BENZOQUINONE	719-22-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-BROMOCHLOROBENZENE	108-37-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-CHLORONITROBENZENE	121-73-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-METHYLCHOLANTHRENE	56-49-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-NITROANILINE	99-09-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3-DICHLOROBENZIDINE	91-94-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-DIMETHOXYBENZIDINE	119-90-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
3,5-DIBROMO-4-HYDROXYBENZONITRILE	1689-84-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,6-DIMETHYLPHENANTHRENE	1576-67-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-AMINOBIPHENYL	92-67-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-BROMOPHENYL PHENYL ETHER	101-55-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-CHLORO-2-NITROANILINE	89-63-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-CHLORO-3-METHYLPHENOL	59-50-7	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
4-CHLOROANILINE	106-47-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-CHLOROPHENYL PHENYL ETHER	7005-72-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-NITROANILINE	100-01-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-NITROBIPHENYL	92-93-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-NITROPHENOL	100-02-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
4,4-METHYLENE-BIS(2-CHLOROANILINE)	101-14-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,5-METHYLENE-PHENANTHRENE	203-64-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-CHLORO-O-TOLUIDINE	95-79-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-NITRO-O-TOLUIDINE	99-55-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7,12-DIMETHYLBENZ(A)ANTHRACENE	57-97-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACENAPHTHENE	83-32-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND
ACENAPHTHYLENE	208-96-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACETOPHENONE	98-86-2	ND		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND		ND	ND
ALPHA-NAPHTHYLAMINE	134-32-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND
ALPHA-TERPINEOL	98-55-5					ND	ND	ND	ND	ND	ND	ND	ND	ND				ND	ND		ND
ANILINE	62-53-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		
ANTHRACENE	120-12-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ARAMITE	140-57-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZANTHRONE	82-05-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENETHIOL	108-98-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZIDINE	92-87-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZOIC ACID	65-85-0	ND				ND	ND	ND	ND	ND	ND	ND	ND		ND						
BENZO(A)ANTHRACENE	56-55-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(A)PYRENE	50-32-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(B)FLUORANTHENE	205-99-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(GHI)PERYLENE	191-24-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(K)FLUORANTHENE	207-08-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZYL ALCOHOL	100-51-6	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
BETA-NAPHTHYLAMINE	91-59-8		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND
BIPHENYL	92-52-4	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BIS(2-CHLOROETHOXY) METHANE	111-91-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BIS(2-CHLOROETHYL) ETHER	111-44-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
BUTYL BENZYL PHTHALATE	85-68-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBAZOLE	86-74-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHRYSENE	218-01-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CROTOXYPHOS	7700-17-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIBENZOFURAN	132-64-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
DIBENZOTHIOPHENE	132-65-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIBENZO(A,H)ANTHRACENE	53-70-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIETHYL PHTHALATE	84-66-2	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIMETHYL PHTHALATE	131-11-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIMETHYL SULFONE	67-71-0	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DI-N-BUTYL PHTHALATE	84-74-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DI-N-OCTYL PHTHALATE	117-84-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIPHENYL ETHER	101-84-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
DIPHENYLAMINE	122-39-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIPHENYLDISULFIDE	882-33-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYL METHANESULFONATE	62-50-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLENETHIOUREA	96-45-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYNYLESTRADIOL-3-METHYL ETHER	72-33-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	206-44-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
FLUORENE	86-73-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND
HEXACHLOROBENZENE	118-74-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXACHLOROBUTADIENE	87-68-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXACHLOROCYCLOPENTADIENE	77-47-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXACHLOROETHANE	67-72-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXACHLOROPROPENE	1888-71-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXANOIC ACID	142-62-1	ND					ND		ND	ND	ND	ND	ND		ND				ND		
INDENO(1,2,3-CD)PYRENE	193-39-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ISOPHORONE	78-59-1			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ISOSAFROLE	120-58-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LONGIFOLENE	475-20-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MALACHITE GREEN	569-64-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHAPYRILENE	91-80-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL METHANESULFONATE	66-27-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	91-20-3		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND		ND		
N-C10 (N-DECANE)	124-18-5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C12 (N-DODECANE)	112-40-3	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C14 (N-TETRADECANE)	629-59-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND
N-C16 (N-HEXADECANE)	544-76-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C18 (N-OCTADECANE)	593-45-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C20 (N-EICOSANE)	112-95-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
N-C22 (N-DOCOSANE)	629-97-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C24 (N-TETRACOSANE)	646-31-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C26 (N-HEXACOSANE)	630-01-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C28 (N-OCTACOSANE)	630-02-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
N-C30 (N-TRIACONTANE)	638-68-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NITROBENZENE	98-95-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODIETHYLAMINE	55-18-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODIMETHYLAMINE	62-75-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODI-N-BUTYLAMINE	924-16-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODI-N-PROPYLAMINE	621-64-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSODIPHENYLAMINE	86-30-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSOMETHYL -ETHYLAMINE	10595-95-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSOMETHYL-PHENYLAMINE	614-00-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSOMORPHOLINE	59-89-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-NITROSOPIPERIDINE	100-75-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N,N-DIMETHYLFORMAMIDE	68-12-2	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
O-ANISIDINE	90-04-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
O-CRESOL	95-48-7	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND			
O-TOLUIDINE	95-53-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
P-CRESOL	106-44-5	ND		ND			ND	ND	ND	ND	ND	ND	ND				ND		ND		
P-CYMENE	99-87-6	ND			ND	ND		ND	ND	ND	ND	ND	ND	ND			ND	ND	ND		ND
P-DIMETHYLAMINO-AZOBENZENE	60-11-7	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTACHLOROBENZENE	608-93-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTACHLOROETHANE	76-01-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTACHLOROPHENOL	87-86-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTAMETHYLBENZENE	700-12-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERYLENE	198-55-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENACETIN	62-44-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	85-01-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND
PHENOL	108-95-2					ND	ND	ND		ND	ND	ND	ND								
PHENOTHIAZINE	92-84-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PRONAMIDE	23950-58-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PYRENE	129-00-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
PYRIDINE	110-86-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
SAFROLE	94-59-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SQUALENE	7683-64-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
STYRENE	100-42-5	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THIANAPHTHENE (2,3-BENZOTHIOPHENE)	95-15-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THIOACETAMIDE	62-55-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
THIOXANTHONE	492-22-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
TRIPHENYLENE	217-59-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRIPROPYLENEGLYCOLMETHYL ETHER	20324-33-8	ND		ND			ND	ND	ND	ND	ND	ND	ND	ND			ND	ND	ND		
1656: PESTICIDES/HERBICIDES																					
ACEPHATE	30560-19-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACIFLUORFEN	50594-66-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
ALACHLOR	15972-60-8	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
ALDRIN	309-00-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ATRAZINE	1912-24-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND			
BENFLURALIN	1861-40-1	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
ALPHA-BHC	319-84-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND	
BETA-BHC	319-85-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
GAMMA-BHC	58-89-9		ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
DELTA-BHC	319-86-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		
BROMACIL	314-40-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
BROMOXYNIL OCTANOATE	1689-99-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
BUTACHLOR	23184-66-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
CAPTAFOL	2425-06-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CAPTAN	133-06-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBOPHENOTHION	786-19-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ALPHA-CHLORDANE	5103-71-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
GAMMA-CHLORDANE	5103-74-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROBENZILATE	510-15-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
CHLORONEB	2675-77-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROPROPYLATE	5836-10-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
CHLOROTHALONIL	1897-45-6	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
DIBROMOCHLOROPROPANE (DBCP)	96-12-8	ND		ND		ND	ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND	
DACTHAL (DCPA)	1861-32-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4,4'-DDD	72-54-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	72-55-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4,4'-DDT	50-29-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND	ND	ND		
DIALLATE A	2303-16-4A	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND
DIALLATE B	2303-16-4B	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		
DICHLONE	117-80-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICOFOL	115-32-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIELDRIN	60-57-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
ENDOSULFAN I	959-98-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND
ENDOSULFAN II	33213-65-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	1031-07-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND
ENDRIN	72-20-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
ENDRIN ALDEHYDE	7421-93-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
ENDRIN KETONE	53494-70-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
ETHALFLURALIN	55283-68-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	
ETRADIAZOLE	2593-15-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FENARIMOL	60168-88-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEPTACHLOR	76-44-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
HEPTACHLOR EPOXIDE	1024-57-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
ISODRIN	465-73-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
ISOPROPALIN	33820-53-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
KEPONE	143-50-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHOXYCHLOR	72-43-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
METRIBUZIN	21087-64-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
MIREX	2385-85-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NITROFEN	1836-75-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
NORFLUORAZON	27314-13-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1016	12674-11-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	11104-28-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	11141-16-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	53469-21-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	12672-29-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	11097-69-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	11096-82-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTACHLORONITROBENZENE (PCNB)	82-68-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
PENDAMETHALIN	40487-42-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
CIS-PERMETHRIN	61949-76-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRANS-PERMETHRIN	61949-77-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERTHANE	72-56-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
PROPACHLOR	1918-16-7	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	
PROPANIL	709-98-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PROPAZINE	139-40-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		
SIMAZINE	122-34-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND			
STROBANE	8001-50-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERBACIL	5902-51-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERBUTHYLAZINE	5915-41-3	ND	ND	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
TOXAPHENE	8001-35-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRIADIMEFON	43121-43-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRIFLURALIN	1582-09-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	
1657: PESTICIDES/HERBICIDES																					
AZINPHOS ETHYL	2642-71-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AZINPHOS METHYL	86-50-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLORFEVINPHOS	470-90-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					**Subtitle D Non-Municipal**														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
CHLORPYRIFOS	2921-88-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
COUMAPHOS	56-72-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CROTOXYPHOS	7700-17-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DEF	78-48-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DEMETON A	8065-48-3A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
DEMETON B	8065-48-3B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIAZINON	333-41-5		ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND		
DICHLORFENTHION	97-17-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
DICHLORVOS	62-73-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
DICROTOPHOS	141-66-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
DIMETHOATE	60-51-5	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIOXATHION	78-34-2	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DISULFOTON	298-04-4	ND	ND				ND	ND	ND		ND		ND	ND	ND	ND	ND		ND	ND	ND
EPN	2104-64-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHION	563-12-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHOPROP	13194-48-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FAMPHUR	52-85-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FENSULFOTHION	115-90-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FENTHION	55-38-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HEXAMETHYLPHOSPHORAMIDE	680-31-9	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
LEPTOPHOS	21609-90-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MALATHION	121-75-5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
MERPHOS	150-50-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
METHAMIDOPHOS	10265-92-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
METHYL CHLORPYRIFOS	5598-13-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL PARATHION	298-00-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
METHYL TRITHION	953-17-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MEVINPHOS	7786-34-7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MONOCROTOPHOS	6923-22-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NALED	300-76-5	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
PARATHION (ETHYL)	56-38-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHORATE	298-02-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHOSMET	732-11-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHOSPHAMIDON E	297-99-4	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
PHOSPHAMIDON Z	23783-98-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RONNEL	299-84-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SULFOTEPP	3689-24-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SULPROFOS	35400-43-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TEPP	107-49-3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND
TERBUFOS	13071-79-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6-8: EPA Sampling Episode List of Analytes Never Detected (continued)

		Non-Hazardous Subcategory														Hazardous Subcategory					
		Subtitle D Municipal					Subtitle D Non-Municipal														
POLLUTANT	**CAS NUM**	E4491	E4626	E4667	E4687	E4738	E4503	E4630	E4631	E4638	E4639	E4644	E4683	E4690	E4721	E4631	E4659	E4682	E4690	E4721	E4759
TETRACHLORVINPHOS	22248-79-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOKUTHION	34643-46-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
TRICHLORFON	52-68-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLORONATE	327-98-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICRESYLPHOSPHATE	78-30-8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRIMETHYLPHOSPHATE	512-56-1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
1658: PESTICIDES/HERBICIDES																					
DALAPON	75-99-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND		ND		ND	ND
DICAMBA	1918-00-9		ND					ND	ND	ND	ND	ND	ND								
DICHLOROPROP	120-36-5	ND	ND					ND	ND	ND	ND	ND	ND								
DINOSEB	88-85-7	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND		ND		ND	ND			
MCPA	94-74-6							ND	ND		ND		ND								
MCPP	7085-19-0					ND	ND	ND	ND		ND		ND			ND			ND		
PICLORAM	1918-02-1	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND		ND	ND	ND			ND	
2,4-D	94-75-7		ND			ND		ND	ND	ND	ND	ND	ND				ND				
2,4-DB	94-82-6		ND	ND		ND		ND	ND	ND	ND	ND	ND		ND						
2,4,5-T	93-76-5	ND	ND					ND	ND	ND	ND	ND	ND			ND	ND				
2,4,5-TP	93-72-1		ND			ND		ND	ND	ND	ND		ND								
CLASSSICAL WET CHEMISTRY																					
AMENABLE CYANIDE	C-025	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	
AMMONIA NITROGEN	7664-41-7										ND										
BOD	C-002													ND							
CHLORIDE	16887-00-6	ND																			
COD	C-004																				
FLUORIDE	16984-48-8																				
HEXANE EXTRACTABLE MATERIAL	C-036	-					-		ND	ND	ND	ND	ND				ND				
HEXAVALENT CHROMIUM	18540-29-9					ND		ND	ND	ND	ND	ND	ND	ND		ND		ND	ND		
NITRATE/NITRITE	C-005																				
PH	C-006																				
RECOVERABLE OIL AND GREASE	C-007		-	-	-	-		-	-	-	-	ND	-	-	-	-	ND	-	-	-	-
TDS	C-010																				
TOC	C-012										ND	ND	ND				ND				
TOTAL CYANIDE	57-12-5			ND	ND	ND	ND				ND	ND	ND	ND					ND		
TOTAL PHENOLS	C-020							ND					ND								
TOTAL PHOSPHORUS	14265-44-2								ND	ND	ND		ND				ND				
TOTAL SOLIDS	C-008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-
TOTAL SULFIDE	18496-25-8		-										ND	ND							
TSS	C-009										ND	ND	ND								

Table 6-9: Subtitle D Non-Hazardous Subcategory Median Raw Wastewater Concentration File

Subtitle D Non-Hazardous Pollutant of Interest	Subtitle D Municipal Median Concentration (ug/L)	Subtitle D Non-Municipal Median Concentration (ug/L)
Conventional		
BOD	240,000	67,000
TSS	137,000	20,500
Classical (Non-Conventional)		
Ammonia as Nitrogen	81,717	75,000
COD	994,000	1,100,000
Hexavalent Chromium	30	
Nitrate/Nitrite	651	950
TDS	2,894,289	4,850,000
TOC	376,521	236,000
Total Phenols	571	251
Organic (Toxic & Non-Conventional)		
1,4-Dioxane	10.8	
2-Butanone	1,082	
2-Propanone	992	
4-Methyl-2-Pentanone	101	
Alpha Terpineol	123	
Benzoic Acid	100	
Hexanoic Acid	5,818	
Methylene Chloride	36.8	
N,N-Dimethylformamide	10	
O-Cresol	15	
P-Cresol	75	
Phenol	102	
Toluene	108	
Tripropyleneglycol Methyl Ether	197	
Metals (Toxic & Non-Conventional)		
Barium	483	
Chromium	28	
Strontium	1,671	4,615
Titanium	63.8	
Zinc	100	
Pesticides/Herbicides (Non-Conventional)		
Dichloroprop	6.1	
Disulfoton	6.1	
Dioxins/Furans (Non-Conventional)		
1234678-HpCDD	0.00014	
OCDD	0.0018	

Table 6-10: Subtitle C Hazardous Subcategory Median Raw Wastewater Concentration File

Subtitle C Hazardous Pollutant of Interest	Median Conc. (ug/L)	Subtitle C Hazardous Pollutant of Interest	Median Conc. (ug/L)
Conventional		**Organics (cont.)**	
BOD	620,500	Toluene	104
Hexane Extractable Material	29,360	Trans-1,2-Dichloroethene	74.3
TSS	151,000	Trichloroethene	44.6
Classical (Non-Conventional)		Tripropyleneglycol Methyl Ether	853
Amenable Cyanide	1,638	Vinyl Chloride	42.7
Ammonia as Nitrogen	268,000	**Metals (Toxic & Non-Coventional)**	
COD	1,308,833	Arsenic	214
Nitrate/Nitrite	1,580	Chromium	47.8
TDS	15,958,333	Copper	36
TOC	440,902	Lithium	450
Total Phenols	25,004	Molybdenum	913
Organics (Toxic & Non-Conventional)		Nickel	240
1,1-Dichloroethane	45.7	Selenium	20
1,4-Dioxane	466	Strontium	3,044
2,4-Dimethylphenol	70	Tin	146
2-Butanone	1,048	Titanium	32.6
2-Propanone	2,889	Total Cyanide	82.5
4-Methyl-2-Pentanone	500	Zinc	100
Alpha Terpineol	95.7	**Pesticides/Herbicides (Non-Coventional)**	
Aniline	237	2,4,5-TP	4.1
Benzene	36.9	2,4-D	5
Benzoic Acid	2,482	2,4-DB	7.9
Benzyl Alcohol	43.6	Dicamba	4
Diethyl Ether	50	Dichloroprop	7.3
Ethylbenzene	44.8	MCPA	209
Hexanoic Acid	2,703	MCPP	870
Isobutyl Alcohol	39.7	Picloram	2
Methylene Chloride	118	Terbuthylazine	14.5
M-Xylene	29.4	**Dioxins/Furans (Non-Conventional)**	
Naphthalene	48.9	1234678-HpCDD	0.00018
O+P Xylene	17.1	1234678-HpCDF	0.00013
O-Cresol	78.8	OCDD	0.00035
Phenol	4,400	OCDF	0.0019
Pyridine	70		
P-Cresol	144		

Table 6-11: Range of Conventional and Selected Nonconventional Pollutants Raw Wastewater Average Concentrations (ug/L)

		Non-Hazardous Subcategory								Hazardous Subcategory			
		Subtitle D Municipal				Subtitle D Non-Municipal							
Pollutant	Cas No.	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND
Amenable Cyanide	C-025	-	-			-	-			0.01	29,895	4	2
Biochemical Oxygen Demand (BOD)	C-002	10,500	7,609,318	31	0	1,000	3,799,333	9	1	22,000	2,962,535	8	0
Total Suspended Solids (TSS)	C-009	6,500	14,470,000	26	0	4,000	16,500,000	8	2	31,667	568,233	9	0
pH	C-006	6.7	9.8	5	0	6.6	9.2	9	0	5.8	11	6	0
Hexane Extractable Material	C-036	5,000	26,000	4	0	5,000	64,000	9	4	5,000	64,800	5	1
Ammonia as Nitrogen	7664417	1,782	2,900,000	24	0	100	5,860,000	9	1	9,767	613,620	6	0
Chemical Oxygen Demand (COD)	C-004	35,000	11,881,700	28	0	80,000	16,700,000	9	0	270,000	6,872,579	8	0
Nitrate/Nitrite	C-005	20	50,800	17	3	50	36,000	9	1	380	192,516	6	0
Total Dissolved Solids (TDS)	C-010	752,000	17,533,000	22	0	936,000	33,900,000	9	0	4,594,917	31,000,000	6	0
Total Organic Carbon (TOC)	C-012	9,400	3,446,084	22	0	10,000	4,820,000	9	2	2,000	3,824,286	8	2
Total Phenols	C-020	50	2,051,249	15	1	50	39,200	9	1	280	192,367	5	0
Total Phosphorus	14265442	17	6,500	17	6	10	22,700	7	2	10	15,900	5	1

#Obs: Number of observations
#ND: Number of non-detects
(-): Not detected in any sample

Table 6-12: Range of Metals and Toxic Pollutants Raw Wastewater Average Concentrations (ug/L)

		Non-Hazardous Subcategory								Hazardous Subcategory			
		Subtitle D Municipal				Subtitle D Non-Municipal							
Pollutant	Cas No.	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND
Aluminum	7429905	60.5	111,100	7	0	21.5	712,000	8	3	-	-	-	-
Arsenic	7440382	-	-	-	-	2	18,300	10	3	17	1,370	9	1
Barium	7440393	43	3,500	19	1	140	3,570	10	0	-	-	-	-
Boron	7440428	36	5,704	7	0	76	16,250	8	0	511	8,175	7	0
Chromium	7440473	2	240	27	9	-	-	-	-	10	720	9	3
Chromium (Hexavalent)	18540299	2	247	9	3	-	-	-	-	-	-	-	-
Copper	7440508	-	-	-	-	-	-	-	-	9	610	9	4
Iron	7439896	2,494	1,667,600	27	0	556	100,000	9	0	3,585	36,758	7	0
Lithium	7439932	-	-	-	-	-	-	-	-	101	1,166	6	0
Magnesium	7439954	24,100	212,480	14	0	8,139	388,000	9	0	8,307	440,767	6	0
Manganese	7439965	149	78,820	20	0	471	7,151	9	0	81	9,045	6	0
Molybdenum	7439987	-	-	-	-	4.2	69	8	4	9	18,757	6	1
Nickel	7440020	-	-	-	-	-	-	-	-	60	2,871	9	0
Phosphorus	7723140	-	-	-	-	-	-	-	-	551	24,650	7	1
Selenium	7782492	-	-	-	-	-	-	-	-	14	173	9	3
Silicon	7440213	1,034	91,100	4	0	2,498	159,000	8	0	2,520	17,911	6	0
Strontium	7440246	787	2,146	4	0	277	30,100	8	0	369	30,839	6	0
Sulfur	7704349	3,969	107,999	4	0	13,700	386,573	7	0	10,360	786,857	6	0
Tin	7440315	-	-	-	-	-	-	-	-	30	1,118	6	1
Titanium	7440326	4	157	6	1	4.4	1,740	8	2	3	764	6	2
Total Cyanide	57125	-	-	-	-	-	-	-	-	10	13,317	10	1
Zinc	7440666	11.5	31,813	27	1	2	1,240	10	1	45.5	846	9	0

#Obs: Number of observations
#ND: Number of non-detects
(-): Not detected in any sample

Table 6-13: Range of Organic Pollutants Raw Wastewater Average Concentrations (ug/L)

		Non-Hazardous Subcategory								Hazardous Subcategory			
		Subtitle D Municipal				Subtitle D Non-Municipal							
Pollutant	Cas No.	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND	Min	Max	#Obs	#ND
1,1-Dichloroethane	75343	-	-	-	-	-	-	-	-	0.5	250	10	4
1,4-Dioxane	123911	10	323	5	2	-	-	-	-	10	7,611	9	5
1234678-HpCDD	35822469	0.00005	0.007	3	1	-	-	-	-	0.00005	0.007	6	2
1234678-HpCDF	67562394	-	-	-	-	-	-	-	-	0.00005	0.001	6	2
2,4-D	94757	-	-	-	-	-	-	-	-	0.5	310	9	4
2,4-DB	94826	-	-	-	-	-	-	-	-	2.9	120	6	1
2,4-Dimethylphenol	105679	-	-	-	-	-	-	-	-	10	2,546	9	5
2,4,5-TP	93721	-	-	-	-	-	-	-	-	0.1	13.2	9	4
2-Butanone	78933	19.3	36,544	14	3	-	-	-	-	50	15,252	10	3
2-Propanone	67641	50	8,614	12	4	50	780	10	6	73	8,166	10	1
4-Methyl-2-Pentanone	108101	35	46,161	13	4	-	-	-	-	50	3,168	9	3
Alpha Terpineol	98555	10	1,061	5	1	-	-	-	-	10	654	6	3
Aniline	62533	-	-	-	-	-	-	-	-	10	2,500	9	5
Benzene	71432	-	-	-	-	-	-	-	-	0.3	229	10	5
Benzoic Acid	65850	0.55	33,335	7	3	-	-	-	-	50	306,194	6	1
Benzyl Alcohol	100516	-	-	-	-	-	-	-	-	10	5,690	6	4
Dicamba	1918009	-	-	-	-	-	-	-	-	0.49	31	6	0
Dichloroprop	120365	1	29	5	2	-	-	-	-	2.2	44	6	1
Diethyl Ether	60297	-	-	-	-	-	-	-	-	10	159	9	5
Disulfoton	298044	2.3	20	5	2	-	-	-	-	-	-	-	-
Ethyl Benzene	100414	-	-	-	-	-	-	-	-	0.5	1,072	10	4
Hexanoic Acid	142621	10	37,256	5	1	-	-	-	-	13	31,086	6	1
Isobutyl Alcohol	78831	-	-	-	-	-	-	-	-	10	10,000	9	6
MCPA	94746	-	-	-	-	50	4370	8	2	15	7,071	6	1
MCPP	7085190	-	-	-	-	50	1900	8	4	13	12,887	6	3
Methylene Chloride	75092	1.6	237	20	6	-	-	-	-	1	19,112	10	4
M-Xylene	108383	-	-	-	-	-	-	-	-	10	650	6	2
Naphthalene	91203	-	-	-	-	-	-	-	-	10	7,799	9	5
N,N-Dimethylformamide	68122	10	1,008	5	3	-	-	-	-	-	-	-	-
OCDD	3268879	0.0001	0.082	3	1	0.0001	0.0176	8	5	0.0001	0.062	6	2
OCDF	39001020	-	-	-	-	-	-	-	-	0.0001	0.012	6	2
O-Cresol	95487	1	2,215	8	6	-	-	-	-	10	626	9	2
O+P Xylene	136777612	-	-	-	-	-	-	-	-	10	230	6	2
P-Cresol	106445	1	998	9	3	-	-	-	-	10	17,396	7	2
Phenol	108952	2	1,425	14	5	-	-	-	-	10	99,947	9	1
Picloram	1918021	-	-	-	-	-	-	-	-	0.5	7.3	5	2
Pyridine	110861	-	-	-	-	-	-	-	-	10	10,000	9	6
Terbuthylazine	5915413	-	-	-	-	-	-	-	-	5	97	5	2
Toluene	108883	3	598	23	5	-	-	-	-	5	2,541	10	3
Trans-1,2-Dichloroethene	156605	-	-	-	-	-	-	-	-	0.4	6,237	10	4
Trichloroethene	79016	-	-	-	-	-	-	-	-	0.5	27,083	10	4
Tripropyleneglycol Methyl Ether	20324338	99	1,235	5	2	-	-	-	-	99	3,182	6	3
Vinyl Chloride	75014	-	-	-	-	-	-	-	-	0.2	1,429	10	5

#Obs: Number of observations
#ND: Number of non-detects
(-): Not detected in any sample

Table 6-14: Dioxins and Furans at Non-Hazardous EPA Sampling Episodes by Episode and Sample Point

Subtitle D Episode/SP	Sample Type	1234678-HpCDD	1234678-HpCDF	OCDD	OCDF	123478-HxCDD	123478-HxCDF	1234789-HpCDF	123678-HxCDD	123678-HxCDF	12378-PeCDD	12378-PeCDF	123789-HxCDD	123789-HxCDF	234678-HxCDF	23478-PeCDF	2378-TCDD	2378-TCDF
Municipal																		
4491 sp01 - inf	grab	140 pg/L	ND	1800 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4626 sp01 - inf	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4626 sp02 - inf	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4626 sp03 - inf	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4626 sp08 - eff	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4626 sp09 - FC	grab	32.9 ng/kg	ND	803 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4626 sp09 - FC	grab	41.2 ng/kg	ND	1100 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp01 - inf	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4667 sp06 - eff	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4667 sp07 - FC	grab	29 ng/kg	ND	279 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp07 - FC	grab	32 ng/kg	ND	271 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp07 - FC	grab	44 ng/kg	ND	308 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp07 - FC	grab	43 ng/kg	ND	338 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4667 sp07 - FC	grab	39 ng/kg	ND	290 ng/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4687 sp01 - inf	comp	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4687 sp03 - eff	comp	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4738 sp01 - inf	grab	240 pg/L	56 pg/L	11,000 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4738 sp02 - inf	grab	480 pg/L	ND	5,300 ng/kg	ND	ND	ND	ND	6 ng/kg	ND	ND	ND	16 ng/kg	ND	ND	ND	ND	ND
Non-Municipal																		
4503 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4630 sp01 - inf	grab	103 pg/L	ND	5380 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4631 sp03 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4638 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4639 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4644 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp04 - inf	grab	ND	ND	503 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Note: Only filter cake was analyzed for dioxins and furans in Municipal episodes 4626 and 4667

sp: sample point
inf: influent
eff: effluent

comp: composite sample
grab: grab sample

NS: Not sampled
ND: Non-detect
FC: Filter cake

mg/L = 1000 ug/L
ug/L = 1000 ng/L
ng/L = 1000 pg/L

Table 6-15: Dioxins and Furans at Hazardous EPA Sampling Episodes by Episode and Sample Point

Episode Sample Point	Sample Type	1234678-HpCDD	1234678-HpCDF	OCDD	OCDF	123478-HxCDD	123478-HxCDF	1234789-HpCDF	123678-HxCDD	123678-HxCDF	12378-PeCDD	12378-PeCDF	123789-HxCDD	123789-HxCDF	234678-HxCDF	23478-PeCDF	2378-TCDD	2378-TCDF
4631 sp01 - inf	grab	13,600 pg/L	1,180 pg/L	116,000 pg/L	6,600 pg/L	ND	95.4 pg/L	162 pg/L	798 pg/L	202 pg/L	ND	79.1 pg/L	196 pg/L	ND	ND	ND	ND	31.1 pg/L
4631 sp02 - inf	grab	479 pg/L	88 pg/L	7,920 pg/L	573 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4659 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4682 sp01 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4682 sp02 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 spD01 - inf	comp	446 pg/L	ND	4,160 pg/L	135 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp01 - inf	comp	752 pg/L	86 pg/L	9,070 pg/L	357 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp01 - inf	comp	593 pg/L	55 pg/L	6,290 pg/L	243 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp01 - inf	comp	576 pg/L	ND	5,040 pg/L	136 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp01 - inf	comp	496 pg/L	62 pg/L	4,630 pg/L	212 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp02 - eff	-	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4721 sp03 - inf	grab	551 pg/L	70 pg/L	5,080 pg/L	162 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp05 - inf	grab	698 pg/L	ND	5,080 pg/L	290 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4721 sp06 - inf	grab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4759 sp01 - inf	comp	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4759 sp03 - eff	comp	ND	ND	100 pg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

sp: sample point
inf: influent
eff: effluent

comp: composite sample
grab: grab sample

D: Duplicate
ND: Non-detect
NS: Not sampled

mg/L = 1000 ug/L
ug/L = 1000 ng/L
ng/L = 1000 pg/L

7.0 POLLUTANT PARAMETER SELECTION

7.1 Introduction

EPA reviewed wastewater characterization data presented in Chapter 6 to identify which pollutant parameters present in landfills wastewater should be considered for regulation. EPA classifies pollutants into the following three categories: conventional, nonconventional, and toxic pollutants. Conventional pollutants include BOD_5, TSS, oil and grease, and pH. Toxic pollutants -- EPA also refers to them as priority pollutants -- include selected metals, pesticides and herbicides, and over 100 organic parameters that represent a comprehensive list of volatile and semi-volatile compounds. Nonconventional pollutants are any pollutants that do not fall within the specific conventional and toxic pollutant lists and include, for example, TOC, COD, chloride, fluoride, ammonia-nitrogen, nitrate/nitrite, total phenol, and total phosphorous.

This chapter presents the criteria used for the selection of pollutant parameters EPA evaluated for regulation and the selection of pollutants for which EPA has established effluent limitations and standards.

7.2 Pollutants Considered for Regulation

To characterize landfill wastewater and to determine the pollutants that it should evaluate for potential limitations and standards, EPA collected wastewater characterization samples at 15 landfill facilities, in addition to influent data collected at six, week-long sampling episodes. EPA analyzed wastewater samples for 470 conventional, toxic, and nonconventional pollutants including metals, organics, pesticides, herbicides, and dioxins and furans. Chapter 6 presents this wastewater characterization data.

From the original list of 470 analytes, EPA developed a list of "pollutants of interest" for each subcategory that it would further evaluate for possible regulation. This list reflects the types of pollutants typically found in landfill wastewater. From this list of pollutants, EPA calculated the current pollutant mass loadings for

the industry and estimated the pollutant loading associated with compliance with the final limitations and standards. The list of pollutants of interest also served as the basis for selecting pollutants for regulation.

7.3 Selection of Pollutants of Interest

EPA determined pollutants of interest for each subcategory using the raw wastewater data collected during the EPA sampling program. Chapter 6 presents the landfill facilities sampled in each subcategory in Table 6-8 and whether EPA detected the pollutants analyzed in the facility's raw wastewater. EPA only included the sampled facilities that were within the scope of the rule to determine the pollutants of interest. Therefore, EPA did not include sampling data from captive exempt facilities nor contaminated ground water data in the analysis. Figure 7-1 presents a diagram of the procedures used to select pollutants of interest.

EPA applied the following criteria to develop a list of pollutants for further evaluation for each subcategory:

1. EPA determined any pollutant detected three or more times in the influent at a concentration at or above 5 times the minimum level at more than one facility to be a pollutant of interest.

2. For dioxins/furans, EPA determined any dioxin or furan detected three or more times in the influent at a concentration above the minimum level at more than one facility to be a pollutant of interest.

3. EPA excluded pollutants that are naturally occurring compounds in soil or ground water at landfill facilities or pollutants that are used as treatment chemicals in this industry from the pollutants of interest list. These compounds include aluminum, boron, calcium, chloride, fluoride, iron, manganese, magnesium, potassium, silicon, sodium, sulfur, total phosphorus, and total sulfide.

Tables 7-1 and 7-2 list the final pollutants of interest for the Non-Hazardous and Hazardous subcategories that EPA has selected for further evaluation after applying these criteria. As shown in Table 7-1, EPA identified separate lists of pollutants of interest for Subtitle D municipal solid waste landfills and Subtitle D non-municipal solid waste landfills. However, EPA combined these two lists for the entire Non-Hazardous landfill subcategory. At proposal, one Non-Hazardous subcategory pollutant of interest, MCPA, was present at non-municipal solid waste landfills and was not present at municipal solid waste landfills. However, after proposal, EPA re-evaluated the status of several facilities in the landfills database

and now classifies an additional nine facilities as captive landfills not included within the scope of this guideline. With the removal of pollutants associated with these facilities from the analysis, EPA determined that, after application of the criteria, MCPA was no longer a pollutant of interest for non-municipal facilities because it was detected only twice in the influent at a concentration at or above 5 times the minimum level at two non-captive facilities. Therefore, EPA did not include MCPA as a pollutant of interest for the Non-Hazardous subcategory for the final rule. Pollutants of interest in both subcategories include conventional, nonconventional, and toxic pollutants and include metals, organics, pesticides, herbicides, and dioxins and furans.

7.4 Development of Pollutant Discharge Loadings

EPA estimated mass loadings of pollutant discharges for the pollutants of interest on a facility-by-facility basis. The Agency calculated pollutant loadings for current discharges and estimated projected discharges based on each of the regulatory options using the procedures described below.

7.4.1 Development of Current Discharge Concentrations

The current discharge concentration database contains the discharge concentration for each pollutant of interest at each facility in each subcategory. The Agency determined mass loadings by multiplying the pollutant concentration by the facility-specific regulated wastewater flow. EPA used all available data including Detailed Questionnaire and Detailed Monitoring Questionnaire data and EPA sampling data to determine mass loadings.

In the Detailed Questionnaire and Detailed Monitoring Questionnaires, EPA requested facilities to provide information on wastewater treatment-in-place and to provide concentration data on treated wastewater effluent. The Agency compiled all effluent wastewater data for each facility after screening the data using the conventions discussed in Chapter 4 for raw wastewater. For facilities with multiple effluent sample points, EPA determined the final effluent concentration by taking a flow weighted average of the samples. From the effluent wastewater data from each facility, the Agency created a data file that contained one

average concentration value for each pollutant of interest at each facility. The amount of data in the file varied significantly from facility to facility. EPA based several of the current discharge concentrations on hundreds of sampling data points obtained through the Detailed Monitoring Questionnaire, while it based others on as few as one sampling data point. The Detailed Monitoring Questionnaire data reflect up to three years of data and are unique to each facility in terms of numbers of parameters analyzed and monitoring frequency. Additionally, monitoring may have been performed weekly, monthly, or quarterly. For facilities sampled by EPA, there was information available for all 470 analytes, and sampling typically reflected the daily performance of a system over a five-day period.

For facilities with wastewater treatment-in-place, but with either no available effluent data or incomplete effluent data, EPA generated a treated effluent average concentration. To develop the treated effluent average concentration, EPA grouped facilities by subcategory and then placed them in treatment-in-place groups, depending on the type of treatment employed on site. Within a treatment-in-place group, the Agency calculated the treated effluent average concentration for a pollutant of interest by taking the median of all weighted source averages for all facilities within the treatment-in-place group. If there were no data for a particular pollutant within a treatment-in-place group, EPA calculated the treated effluent average concentration for a pollutant of interest in a subcategory by taking the median of all weighted source averages for all facilities within the entire subcategory.

For facilities with no treatment-in-place, the Agency used raw wastewater concentrations to represent current effluent discharge values. EPA calculated facility averages using all available data sources and using the procedures outlined above. For facilities with no treatment-in-place and with either no influent data or incomplete influent data, the Agency used the subcategory median raw wastewater concentration (see Section 6.3.3 for details on developing the Median Raw Wastewater Concentration File) to represent the current discharge for each pollutant of interest.

For the Hazardous subcategory and for Subtitle D non-municipal solid waste facilities in the Non-Hazardous subcategory, there were insufficient effluent data to calculate a representative treatment-in-place or subcategory treated effluent average concentration result for several pollutants of interest. The alternate methodologies developed to calculate representative current discharge concentration values for both the Hazardous subcategory and for Subtitle D non-municipal facilities in the Non-Hazardous subcategory are discussed below.

7.4.1.1 Alternate Methodology for Non-Hazardous Subcategory: Subtitle D Non-Municipal

For Subtitle D non-municipal solid waste facilities in the Non-Hazardous subcategory, EPA used the effluent data from municipal solid waste landfills to supplement insufficient non-municipal data. EPA concluded this was appropriate in the circumstances because of the similarities in the median raw wastewater concentrations from Subtitle D municipal and non-municipal facilities. Table 6-7 in Chapter 6 presents the Subtitle D municipal and non-municipal median raw wastewater concentration data.

EPA employed the following procedure to calculate current discharge concentrations for Subtitle D non-municipal solid waste facilities. First, EPA used all available non-municipal landfill effluent data. Next, EPA placed non-municipal facilities in municipal facility treatment-in-place groups according to treatment employed on site. Then, EPA used municipal landfills treatment-in-place treated effluent average concentrations for each non-municipal facility with insufficient data.

7.4.1.2 Alternate Methodology for the Hazardous Subcategory

EPA estimated current discharge concentrations for the facilities in the Hazardous subcategory using the long-term averages developed for the subcategory (see Chapter 11: Development of Effluent Limitations and Standards). EPA's data collection efforts did not identify any direct discharging hazardous landfills, and EPA obtained detailed information from only three indirect discharging landfills. Therefore, the Agency modeled the current discharge concentrations on the small number of indirect discharging facilities in the

EPA database as a function of the expected discharge concentrations after treatment using the long-term averages. EPA used industry-provided effluent data whenever available.

The Agency developed an approach based upon the installed treatment system at the facility. EPA estimated the current discharge concentration as twice the long-term average (LTA) for a facility without any biological or chemical treatment-in-place. The modeling approach used to develop the current discharge concentration (CDC) for the indirect dischargers in the Hazardous subcategory is presented below.

QID	Treatment-In-Place	Modeling Scheme
16017	Separation and neutralization	2 x LTA^{med}
16041	Sequencing batch reactors	LTA
16087	Equalization, chemical precipitation, primary sedimentation, activated sludge, and secondary sedimentation	LTA

For facility 16017, the current discharge concentration value was based upon a function of the LTA^{med}. The LTA^{med} is the median of the long-term averages in the Hazardous subcategory. The long-term averages used in this subcategory are from BAT facilities 16041 and 16087. Therefore, the corresponding long-term averages were used for both of these BAT facilities.

7.4.2 Development of Pollutant Mass Loadings

Using the current discharge concentrations discussed above, EPA generated mass loading estimates for each pollutant of interest at each facility by multiplying the current discharge concentration value by the facility's average daily discharge flow rate. This resulted in mass loadings, reported in pounds per day, for each facility in the database. EPA calculated mass loadings to determine the amount of pollution discharged directly or indirectly to surface waters by landfill facilities and to estimate the amount of pollutant reduction after implementation of each regulatory technology option. Summaries of pollutant mass loadings for the selected regulatory options are presented in Chapter 11.

7.5 Assessment of Pollutants of Interest

As indicated above, EPA developed extensive lists of pollutants of interest for this industry. EPA used the full list of pollutants of interest to develop pollutant loadings and pollutant reductions as a result of treatment. However, the Agency only selected certain pollutants for regulation, since specific regulation of every pollutant is not always the most cost-effective approach to developing effluent limitations guidelines.

The treatment technologies evaluated as the basis of the regulation remove classes of compounds with similar treatability characteristics. Several of the pollutants of interest in the Landfills industry are similar in terms of their chemical structure and treatability. As a result, the regulation of a set of pollutants within a chemical class ensures that the treatment technologies will provide adequate control of other pollutants of interest within that class of compounds.

Based upon this analysis, EPA decided not to regulate certain pollutants of interest in the Non-Hazardous and Hazardous subcategories because their removals are represented adequately by another regulated pollutant, as discussed in the sections below. In addition, the Agency did not select several other pollutants of interest for regulation because EPA found these pollutants at concentrations below treatable levels in the Landfills industry. EPA also did not select pollutants for regulation if the Agency determined that these pollutants were found at only trace amounts in the industry, and therefore were not likely to cause toxic effects. The Agency also excluded several pollutants of interest from regulation because the selected BPT treatment technology would not remove these pollutants.

7.6 Selection of Pollutants To Be Regulated for Direct Dischargers

Based upon the data analyses outlined above, EPA developed a list of pollutants to be regulated for the Hazardous and Non-Hazardous subcategories. Figure 7-2 presents a diagram that illustrates the procedures used to select the regulated pollutants. EPA is not establishing effluent limitations and standards for all conventional, toxic, and nonconventional pollutants. There may be pollutants present in a specific landfill or type of landfill for which EPA did not establish limitations under this guideline but which may be

of concern to a receiving stream or POTW. Due to the specific nature of landfill waste at various sites, permit writers and local authorities may need to consider case-by-case limitations or standards for these pollutants. EPA's regulations require the permit writer or local authority to include technology-based limits for any toxic pollutant which is or may be discharged at a level greater than the level which can be achieved by treatment requirements appropriate to the permittee or which may pass through or interfere with POTW operations. (40 CFR § 122.44(e), 125.3. *See also* 40 CFR § 403.5(c) which requires the establishment of local limits in a POTW pretreatment program for any pollutant which may cause pass through or interference). The following sections discuss EPA's reasons for not establishing effluent limitations for selected pollutants.

7.6.1 Non-Hazardous Subcategory Pollutants to be Regulated for Direct Dischargers

EPA developed the list of pollutants to be regulated for the Non-Hazardous subcategory from the pollutants of interest list for the Non-Hazardous subcategory. The non-hazardous pollutants of interest list combines the pollutants of interest from Subtitle D municipal and non-municipal solid waste facilities for a total of 32 pollutants of interest. The BPT/BAT facilities selected by EPA demonstrate removal of the regulated pollutants. These facilities employed equalization, biological treatment, and for some, multimedia filtration. Initially, EPA considered regulating all 32 pollutants of interest. After a thorough analysis, EPA, however, chose not to set limitations for 24 pollutants of interest under BPT/BAT/NSPS for one of the following reasons:

- The pollutant (or pollutant parameter) is controlled through the regulation of other pollutants (or pollutant parameters).
- The pollutant (or pollutant parameter) is present in only trace amounts in the subcategory and/or is not likely to cause toxic effects.
- C The pollutant (or pollutant parameter) is not controlled by the selected BPT technology.

The following seven Non-Hazardous subcategory pollutants of interest are pollutants that are controlled through the regulation of other pollutants**:**

Seven Pollutants Not Selected for Regulation in the Non-Hazardous Subcategory Because They Are Controlled Through the Regulation of Other Pollutants
COD
TOC
Total Phenols
Hexanoic Acid
O-Cresol
Tripropyleneglycol Methyl Ether
Titanium

COD is an alternative method of estimating the oxygen demand of the wastewater. However, EPA selected BOD_5 for regulation because it is more appropriately controlled by a biological treatment system. TOC measures all oxidizable organic material in a waste stream, including the organic chemicals not oxidized (and, therefore, not detected) in BOD_5 and COD tests. TOC is a rapid test for estimating the total organic carbon in a waste stream. For reasons similar to those used for not selecting COD for regulation, EPA did not select TOC for regulation. Total phenols is a general wet chemistry indicator measurement for phenolic compounds. Regulation of phenol will control other phenolic compounds. Similarly, hexanoic acid is relatively biodegradable and should be controlled by regulating benzoic acid. O-cresol is structurally similar to p-cresol and should be controlled by regulating p-cresol. Tripropyleneglycol methyl ether has treatability characteristics similar to alpha terpineol in a biological treatment system and should be controlled by regulating alpha terpineol. EPA determined that titanium will be removed incidentally by biological treatment in the same manner as zinc, through sorption into the biomass. Therefore, titanium should be controlled by regulating zinc.

In the proposal, EPA chose not to regulate 2-butanone, 2-propanone, and 4-methyl-2-pentanone because they were controlled through the regulation of toluene. After proposal EPA decided not to regulate toluene. The reasons these pollutants were not selected for regulation in the final rule are discussed below.

The following thirteen Non-Hazardous subcategory pollutants of interest are present in only trace amounts and/or are not likely to cause toxic effects:

Thirteen Pollutants Not Selected for Regulation in the Non-Hazardous Subcategory Because They Are Present in Only Trace Amounts and/or Are Not Likely to Cause Toxic Effects
Nitrate/Nitrite
TDS
1,4-Dioxane
4-Methyl-2-Pentanone
Methylene Chloride
N,N-Dimethylformamide
Toluene
Barium
Chromium
Dichloroprop
Disulfoton
1,2,3,4,6,7,8-HpCDD
OCDD

EPA presents the Non-Hazardous subcategory median raw wastewater concentration data for the pollutants of interest in Chapter 6, Table 6-9, and the minimum and maximum concentrations for conventional and nonconventional pollutants, metals, organic pollutants, and dioxins/furans in Tables 6-11 through 6-14.

For this industry, nitrate/nitrite is used primarily as a measure of the extent of nitrification that occurs during the biodegradation process. Typically, levels of nitrate/nitrite found in landfill wastewater do not require removal. Removal of nitrate/nitrite can be obtained by specially designed biological treatment systems (such as nitrification/denitrification systems) that are able to complete the conversion of nitrate/nitrite to nitrogen gas. Often, removal of nitrate/nitrite is required to address specific water quality concerns for an individual receiving water (i.e., nutrient problems in the Great Lakes). EPA has determined that the levels of nitrate/nitrite in landfill wastewater do not justify regulation on a national level and individual permit writers can address specific water quality considerations.

TDS is used primarily as a water quality measurement and not as a pollutant that can be controlled through biological treatment. It often is used as a measurement of the salinity of an ambient water or a wastewater and often indicates the presence of naturally occurring salts of metals such as sodium, iron, and magnesium. While it can inhibit biological treatment processes at levels above 10,000 mg/L, acclimated biological treatment systems can operate successfully with influent TDS concentrations as high as 76,000 mg/L (reference 55). The median concentration of total dissolved solids in the Non-Hazardous subcategory was only 4,850 mg/L for non-municipal solid waste landfills and 2,890 mg/L for municipal solid waste landfills. Therefore, EPA has determined that concentrations of total dissolved solids found in landfills in the Non-Hazardous subcategory do not justify regulation. EPA's sampling data showed levels of n,n-dimethylformamide in landfill wastewater generally near the analytical detection limit (median concentration for non-hazardous municipal solid waste landfills was 10 ug/L) and, because of this low concentration throughout the subcategory, regulation was not warranted.

EPA classifies four pollutants, 1,4-dioxane, 4-methyl-2-pentanone, methylene chloride, and toluene as "volatile organics" under analytical test method 1624. In the proposed rule, EPA established direct discharge limitations for toluene for landfills in the Non-Hazardous subcategory. However, after proposal, EPA decided not to regulate toluene because it is not treated by the biological treatment technology selected as the basis for the landfills effluent limitations. Furthermore, based on the concentration of toluene in untreated municipal leachate (108 ug/L), the Agency concluded that the loading of toluene to the atmosphere will not cause toxic effects.

While EPA acknowledges that a small portion of the removal of these pollutants is due to biological degradation, these pollutants are highly volatile and the primary mechanism for their removal from wastewater is through volatilization to the atmosphere. EPA based these final regulations on the performance of an aerated biological system. Wastewater aeration may increase the volatilization of certain organic compounds, a potential environmental concern. While EPA does not recognize the transfer of pollutants from one media to another as effective treatment, based on the concentrations of these pollutants

in untreated wastewater (below treatable levels (10 times the method detection limit)), indications are that the potential increase in air emissions due to this regulation will be minimal.

Volatile organic compound (VOC) levels in historic landfill leachate (from both hazardous and non-hazardous waste landfills dating from the 1930s to the mid-1990s) are also at levels which are low enough as not to call into question EPA's determination to base these rules on the performance of aerated biological systems. Tables 6-9, 6-10, and 6-13 show the concentrations of VOCs found in landfill wastewater.

Furthermore, EPA's Office of Air and Radiation is currently evaluating the air emissions from wastewater generated at municipal solid waste landfills, and intends to take the landfills effluent limitations guidelines into account in determining whether further controls under Section 112 of the Clean Air Act (which requires technology-based standards for hazardous air pollutants emitted by major sources of emissions of those pollutants) are justified. (Preliminary indications are that hazardous air pollutant emissions from aeration would be a minor fraction of those from other landfill emission sources such as landfill gas emissions.)

EPA's sampling detected two metals, barium and chromium, below treatable levels at non-hazardous landfills in the EPA database. The median raw wastewater concentrations of barium and chromium found at municipal landfills is 0.48 mg/L and 0.03 mg/L, respectively, less than 5 times the method detection limit. EPA is excluding these two metals from regulation because, at the concentrations found at non-hazardous landfills, these pollutants are not likely to cause toxic effects.

EPA found low levels of dichloroprop, disulfoton, 1,2,3,4,6,7,8-HpCDD, and OCDD in raw wastewater at several Non-Hazardous subcategory landfills. At the concentrations found, EPA expects these pollutants to partition to the biological sludge created as a result of the use of the BPT/BAT treatment technologies. EPA sampling data and calculations conclude that the concentrations of these pollutants present in the wastewater will not prevent the sludge from being redeposited in a non-hazardous landfill.

The following four pollutants were not selected for regulation in the Non-Hazardous subcategory because they are not controlled by the selected BPT/BAT technology:

Four Pollutants Not Selected for Regulation in the Non-Hazardous Subcategory Because They Are Not Controlled by the Selected BPT/BAT Technology
2-Butanone
2-Propanone
Hexavalent Chromium
Strontium

EPA classifies 2-butanone and 2-propanone as "volatile organics" under analytical test method 1624. Because the selected BPT/BAT technology for the Non-Hazardous subcategory is aerated equalization followed by biological treatment and then multimedia filtration, EPA determined that the majority of the removal of volatile organic compounds is due to volatilization to the atmosphere in either the aerated equalization tanks or in the activated sludge aeration basin. Therefore, EPA did not regulate volatile organic pollutants because the BPT/BAT technology does not provide controls for the removal of these pollutants.

EPA detected hexavalent chromium and strontium in wastewater at the facilities selected as the basis for BPT/BAT/NSPS, but EPA did not have adequate removal data at the BPT/BAT/NSPS facilities employing biological treatment and, therefore, these pollutants could not be regulated. For both pollutants, EPA had removal data from one BPT/BAT facility. In both cases, the BPT facilities demonstrated negative percent removals of these pollutants. In addition to the lack of adequate data, EPA determined that for this subcategory, these metals are not present in concentrations that are likely to cause toxic effects. Therefore, these two metals were excluded from regulation in the Non-Hazardous subcategory.

In conclusion, the following eight pollutants of interest are regulated under BPT/BAT/NSPS in the Non-Hazardous subcategory:

Eight Pollutants Selected for Regulation in the Non-Hazardous Subcategory
Ammonia as Nitrogen
BOD_5
TSS
Alpha Terpineol
Benzoic Acid
P-Cresol
Phenol
Zinc

The Agency wishes to note that zinc was selected for regulation in spite of the fact that exclusion criteria used to eliminate other pollutants of interest apply, at least partially. Zinc has been selected for regulation in spite of its relatively low untreated wastewater concentration. The median concentration of zinc found in raw wastewater at municipal solid waste landfills and at non-municipal solid waste landfills is 0.10 mg/L and 0.09 mg/L, respectively. EPA selected zinc for regulation because EPA observed incidental removals ranging from 58 percent to 90 percent at the treatment systems selected for BPT. Additionally, EPA's sampling did not find raw wastewater concentrations of zinc at levels that would inhibit biological treatment systems (see Chapter 11, Section 11.2.1).

Chapter 11 describes in detail the development of the effluent limitations for each of these pollutants.

7.6.2 Hazardous Subcategory Pollutants to be Regulated for Direct Dischargers

EPA developed the list of pollutants to be regulated for the Hazardous subcategory from the Hazardous subcategory pollutants of interest list. The two BPT/BAT facilities selected by EPA demonstrate removal of the regulated pollutants through the use of chemical precipitation and biological treatment. Initially, EPA considered regulating all 63 pollutants of interest; EPA chose, however, not to set limitations for 50 pollutants of interest under BPT/BAT/NSPS for one of the following reasons:

- The pollutant (or pollutant parameter) is controlled through the regulation of other pollutants (or pollutant parameters).

- The pollutant (or pollutant parameter) is present in only trace amounts in the subcategory and/or is not likely to cause toxic effects.

C The pollutant (or pollutant parameter) is not controlled by the selected BPT technology.

As discussed in Chapter 6, after proposal, EPA analyzed the raw wastewater characterization data for hazardous landfills without CERCLA ground water data. As a result, raw wastewater concentrations for several pollutants of interest have changed since proposal and, therefore, in some cases, EPA's reasons for not selecting these pollutants for regulation also have changed.

EPA did not select the following thirteen Hazardous subcategory pollutants of interest for regulation because they are controlled through the regulation of other pollutants:

Thirteen Pollutants Not Selected for Regulation in the Hazardous Subcategory Because They Are Controlled Through the Regulation of Other Pollutants
COD
TOC
Total Phenols
2,4-Dimethylphenol
Benzyl Alcohol
Diethyl Ether
Isobutyl Alcohol
Hexanoic Acid
O-Cresol
Tripropyleneglycol Methyl Ether
Molybdenum
Nickel
Strontium

COD is an alternative method of estimating the oxygen demand of the wastewater. EPA, however, selected BOD_5 for regulation because it is more appropriately controlled by a biological treatment system. TOC measures all oxidizable organic material in a waste stream, including the organic chemicals not oxidized (and, therefore, not detected) in BOD_5 and COD tests. TOC is a rapid test for estimating the total

organic carbon in a waste stream. For similar reasons to the rationale for not selecting COD for regulation, EPA did not select TOC for regulation.

While present in treatable concentrations, EPA did not have adequate removal data for molybdenum, nickel, and strontium at the Hazardous subcategory BPT/BAT facilities. However, these metals should be controlled adequately through the regulation of both chromium and zinc. Total phenols is a general, wet chemistry indicator measurement for phenolic compounds and should be controlled by regulating phenol. Similarly, 2,4-dimethylphenol has chemical and treatability characteristics similar to phenol and, therefore, should also be controlled through the regulation of phenol. Hexanoic acid, benzyl alcohol, and isobutyl alcohol are relatively biodegradable and should be controlled by regulating benzoic acid. O-cresol is structurally similar to p-cresol and should be controlled by regulating p-cresol. Tripropyleneglycol methyl ether and diethyl ether have treatability characteristics similar to alpha terpineol in a biological treatment system and should be controlled by regulating alpha terpineol.

In the proposal, EPA chose not to regulate 2-butanone, 2-propanone, 4-methyl-2-pentanone, ethylbenzene, m-xylene, and o+p xylene because they were controlled through the regulation of toluene. After proposal EPA decided not to regulate toluene. The reasons these pollutants were not selected for regulation in the final rule are discussed below.

EPA did not select the following sixteen pollutants of interest for regulation in the Hazardous subcategory because they are present in only trace amounts and/or are not likely to cause toxic effects:

Sixteen Pollutants Not Selected for Regulation in the Hazardous Subcategory Because They Are Present in Only Trace Amounts and/or Are Not Likely to Cause Toxic Effects
Hexane Extractable Material
Nitrate/Nitrite
TDS
2,4-D
2,4-DB

2,4,5-TP
Dicamba
Dichloroprop
MCPA
MCPP
Picloram
Terbutylazine
1,2,3,4,6,7,8-HpCDD
1,2,3,4,6,7,8-HpCDF
OCDD
OCDF

EPA presents the Hazardous subcategory median raw wastewater concentration data for the pollutants of interest in Chapter 6, Table 6-10, and the minimum and maximum concentrations for conventional and nonconventional pollutants, metals, organic pollutants, and dioxins/furans in Tables 6-11 through 6-13, and Table 6-15.

For this industry, nitrate/nitrite is used primarily as a measure of the extent of nitrification that occurs during the biodegradation process. Typically, levels of nitrate/nitrite found in landfill wastewater do not require removal. Removal of nitrate/nitrite can be obtained by specially designed biological treatment systems (such as nitrification/denitrification systems) that are able to complete the conversion of nitrate/nitrite to nitrogen gas. Often, removal of nitrate/nitrite is required to address specific water quality concerns for an individual receiving water (i.e., nutrient problems in the Great Lakes). EPA has, however, determined that the levels of nitrate/nitrite in landfill wastewater do not justify regulation on a national level and individual permit writers can address specific water quality considerations.

TDS is used primarily as a water quality measurement and not as a pollutant that can be controlled through biological treatment. It often is used as a measurement of the salinity of an ambient water or a wastewater and often indicates the presence of naturally occurring salts of metals such as sodium, iron, and magnesium. While it can inhibit biological treatment processes at levels above 10,000 mg/L, acclimated biological

treatment systems can operate successfully with influent TDS concentrations as high as 76,000 mg/L (reference 55). The median concentration of total dissolved solids was 16,000 mg/L for landfills in the Hazardous subcategory. Therefore, EPA has determined that concentrations of total dissolved solids found in landfills in the Hazardous subcategory do not justify regulation. Similarly, hexane extractable material is a general, wet chemistry indicator measurement for oil and grease compounds that generally can be controlled through source reduction and good housekeeping. Therefore, EPA did not select hexane extractable material for regulation.

EPA detected low levels of 2,4-D, 2,4-DB, 2,4,5-TP, dicamba, dichloroprop, MCPA, MCPP, picloram, terbutylazine, 1,2,3,4,6,7,8-HpCDD, 1,2,3,4,6,7,8-HpCDF, OCDD, and OCDF in three out of five of the Hazardous subcategory landfills sampled during EPA's sampling program. At the concentrations found in raw landfill wastewater, EPA expects these pollutants to partition to the biological sludge created as a result of the use of the BPT/BAT treatment technologies. EPA sampling data and calculations conclude that the concentrations of these pollutants present in the untreated wastewater will not prevent the sludge from being redeposited in a hazardous landfill.

EPA did not select the following twenty-one pollutants for regulation in the Hazardous subcategory because they are not controlled by the selected BPT/BAT technology:

Twenty-One Pollutants Not Selected for Regulation in the Hazardous Subcategory Because They Are Not Controlled by the Selected BPT/BAT Technology
Amenable Cyanide
Total Cyanide
1,1-Dichloroethane
1,4-Dioxane
2-Butanone
2-Propanone
4-Methyl-2-Pentanone
Benzene
Ethylbenzene

M-Xylene
Methylene Chloride
O+P Xylene
Toluene
Trans-1,2-Dichloroethene
Trichloroethene
Vinyl Chloride
Copper
Lithium
Selenium
Tin
Titanium

EPA classifies 1,1-dichloroethane, 1,4-dioxane, 2-butanone, 2-propanone, 4-methyl-2-pentanone, benzene, ethylbenzene, m-xylene, methylene chloride, o+p xylene, toluene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride as "volatile organics" under analytical test method 1624. Because the selected BPT/BAT technology for the Hazardous subcategory is aerated equalization followed by chemical precipitation, biological treatment, and multimedia filtration, EPA determined that the majority of the removal of volatile organic compounds is due to volatilization to the atmosphere in either the aerated equalization tanks or in the activated sludge aeration basin. Therefore, EPA did not regulate volatile organic pollutants because the BPT/BAT technology does not provide controls for removal of these pollutants.

While EPA does not recognize the transfer of pollutants from one media to another as effective treatment, based on the concentrations of these pollutants in untreated wastewater (below treatable levels (10 times the method detection limit)), indications are that the potential increase in air emissions due to this regulation will be minimal.

Volatile organic compounds (VOCs) in hazardous waste landfill leachate are being steadily minimized due to the Resource Conservation and Recovery Act (RCRA) land disposal restriction rules, which typically require aggressive destructive treatment of organics in hazardous wastes before the waste can be landfilled

(see 40 CFR 268.40 and 268.48).[1] VOC levels in historic landfill leachate (from both hazardous and non-hazardous waste landfills dating from the 1930s to the mid-1990s) are also at levels which are low enough as not to call into question EPA's determination to base these rules on the performance of aerated biological systems. Tables 6-9, 6-10, and 6-13 show the concentrations of VOCs found in landfill wastewater.

For the proposed rule, EPA established direct discharge limitations for benzene and toluene for landfills in the Hazardous subcategory. However, after proposal, EPA decided not to regulate benzene and toluene because they are not treated by the chemical or biological treatment technology selected as the basis for the landfills effluent limitations. Furthermore, based on the concentration of benzene (37 ug/L) and toluene (104 ug/L) in untreated leachate, the Agency concluded that the loading of benzene and toluene to the atmosphere will not cause toxic effects.

The Hazardous subcategory median untreated wastewater concentrations for copper, lithium, selenium, tin, and titanium were well below treatable concentrations (10 times the method detection limit). Median untreated wastewater concentrations ranged from 0.02 mg/L to 0.03 mg/L for selenium, copper, and titanium, 0.15 mg/L for tin, and 0.45 mg/L for lithium. While the metals are incidentally removed by the BPT/BAT technology, these concentrations are well below treatable concentrations for conventional metals precipitation technologies.

For total cyanide, the median untreated wastewater concentration for the Hazardous subcategory is 0.08 mg/L, which is well below treatable concentrations for conventional cyanide destruction technologies. While the median raw wastewater concentration of amenable cyanide at hazardous landfills is 1.6 mg/L, EPA concluded that the median untreated wastewater concentration data for total cyanide is more

[1] There are certain exceptions to these treatment requirements for hazardous wastewater which is disposed in surface impoundments. RCRA section 3005 (j) (11). However, if this wastewater contains VOCs above a designated concentration level, then the impoundments are subject to rules requiring control of the resulting air emissions. 40 CFR 264.1085 and 263.1086.

representative than amenable cyanide data of cyanide concentrations in hazardous landfill wastewater because the Agency collected data from ten facilities on total cyanide (one of which was non-detect) and only four facilities (two of which were non-detect) on amenable cyanide.

Based on these factors, the Agency concluded that the five metals plus amenable and total cyanide were present in untreated landfill wastewater at concentrations that were too low to be treated effectively by conventional metals and cyanide treatment technologies (chemical precipitation and chemical oxidation, respectively). Because EPA's BPT/BAT technology does not control these small concentrations of pollutants, the Agency has decided to exclude them from regulation.

In conclusion, the following 13 pollutants of interest will be regulated under BPT/BAT/NSPS in the Hazardous subcategory:

Thirteen Pollutants Selected for Regulation in the Hazardous Subcategory
Ammonia as Nitrogen
BOD_5
TSS
Alpha Terpineol
Aniline
Benzoic Acid
Naphthalene
P-Cresol
Phenol
Pyridine
Arsenic
Chromium
Zinc

Chapter 11 describes in detail the development of the effluent limitations for each of these pollutants.

7.7 Selection of Pollutants to be Regulated for Indirect Dischargers

Section 307(b) of the Clean Water Act (CWA) requires the Agency to promulgate pretreatment standards for existing sources (PSES) and new sources (PSNS). To establish pretreatment standards, EPA must first determine whether each BAT pollutant under consideration is not susceptible to treatment by a POTW, or interferes with the POTW's operation or sludge disposal practices.

7.7.1 Pass-Through Analysis for Indirect Dischargers

The Agency evaluated whether a pollutant is susceptible to treatment at a POTW by comparing removals between direct dischargers and well-operated POTWs for pollutants of interest for both subcategories, listed in Tables 7-1 and 7-2. In comparing removals, the Agency compares the percentage of a pollutant removed by POTWs with the percentage of the pollutant removed by direct discharging facilities applying BAT.

EPA compares removals for two reasons: 1) to ensure that wastewater treatment performance for indirect dischargers is equivalent to that for direct dischargers, and 2) to recognize and take into account the treatment capability and performance of the POTW in regulating the discharge of pollutants from indirect dischargers. Rather than compare the mass or concentration of pollutants discharged by the POTW with the mass or concentration of pollutants discharged by a BAT facility, EPA compares the percentage of the pollutants removed by the BAT treatment system with the POTW removal. EPA takes this approach because a comparison of mass or concentration of pollutants in a POTW effluent to pollutants in a BAT facility's effluent would not take into account the mass of pollutants discharged to the POTW from non-industrial sources, nor the dilution of the pollutants in the POTW effluent to lower concentrations from the addition of large amounts of non-industrial wastewater.

To establish the performance of well-operated POTWs, EPA used the information provided from “Fate of Priority Pollutants in Publicly Owned Treatment Works” (commonly referred to as the 50-POTW Study), supplemented by EPA's National Risk Management Research Laboratory's (NRMRL) treatability

database. EPA used NRMRL's database for those pollutants not found in the 50-POTW study. Chapter 4 discusses these studies in detail.

The 50-POTW Study presents data on 50 well-operated POTWs achieving secondary treatment. For this rulemaking, EPA edited the data in the 50-POTW Study and the data collected for this rule. Because the 50-POTW Study data included influent levels that were close to the detection limit, EPA eliminated these values, thereby minimizing the possibility that low POTW removals might simply reflect low influent concentrations instead of being a true measure of treatment effectiveness. EPA applied the following hierarchal data editing rules to the 50-POTW Study data:

1) Include only detected pollutants having at least three pairs (influent/effluent) of data points.

2) Eliminate average pollutant influent values less than 10 times the minimum analytical detection limit, along with the corresponding effluent values.

3) For analytes where no average influent concentrations were greater than 10 times the minimum level[2], eliminate all average influent values less than five times the minimum level, along with the corresponding effluent values;

4) For analytes where no average influent concentration was greater than five times the minimum level, eliminate all average influent concentrations less than 20 ug/L, along with the corresponding effluent values.

After editing the database, EPA then calculated POTW-specific percent removals for each pollutant based on its average influent and average effluent values. The POTW percent removal used for each pollutant in the pass-through test is the median value of all the POTW specific percent removals for that pollutant. EPA then compared the median POTW percent removal to the median percent removal for the BAT option treatment technology to determine pass through.

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[2] In applying the data editing rules for the 50-POTW Study for the final rule, the minimum level assigned to the non-detect values was the minimum level at the time of the 50-POTW Study (circa 1978-1980). For the proposal, the minimum level assigned to the non-detect values for 50-POTW removals was the Landfills study minimum levels (circa 1994).

The 50-POTW Study did not contain data for all pollutants for which the pass-through analysis was required. Therefore, EPA obtained additional data from EPA's NRMRL Treatability Database . The database provides the user with the specific source and the industry from which the wastewater was generated. EPA used the NRMRL database to augment the POTW database for the pollutants for which the 50-POTW Study did not cover. EPA applied the following data editing rules to the data in the NRMRL database:

1) Only use treatment technologies representative of typical POTW secondary treatment operations (aerobic lagoons, activated sludge, activated sludge with sedimentation and/or filtration).

2) Only use domestic or industrial wastewater data.

3) Use pilot-scale and full-scale data; eliminate bench-scale data.

4) Use data from a paper in a peer-reviewed journal or government report; edit out lesser quality references.

5) Eliminate zero or negative percent removals.

6) For each of the NRMRL sources, EPA first selected data having at least three pairs (influent/effluent) of data points. If no data source contained three pairs of data points, then EPA selected only those facilities having at least two pairs of data points. If none of the data sources contained two pairs of data points, then EPA selected those with one pair (influent/effluent) of data points. EPA applied the paired data editing criteria explained above to the following hierarchy of NRMRL data sources:

    a. NRMRL Treatability data at > 10xMDL – Domestic wastewater.
    b. NRMRL Treatability data at > 5xMDL – Domestic wastewater.
    c. NRMRL Treatability data at >20 ug/L - Domestic wastewater.
    d. NRMRL Treatability data at > 10xMDL – Industrial wastewater.
    e. NRMRL Treatability data at > 5xMDL – Industrial wastewater.
    f. NRMRL Treatability data at >20 ug/L – Industrial wastewater.
    g. NRMRL Treatability data - any available Domestic and/or Industrial data.
    h. Generic pollutant group removal data.

From the NRMRL facilities remaining after applying the above editing criteria, EPA determined the median percent removal for a particular pollutant. The Agency used this median percent removal to represent

POTW removal and compared it to the median percent removal for the BAT option treatment technology in order to determine pass through.

Tables 7-3 and 7-4 present the POTW percent removals for each regulated pollutant in the Non-Hazardous and Hazardous subcategory, respectively. These tables indicate the source of the percent removal and which editing criteria applied.

7.7.2 Non-Hazardous Subcategory Pollutants to be Regulated for Indirect Dischargers

EPA conducted a removal comparison on the priority and nonconventional pollutants regulated under BAT for non-hazardous landfills. EPA did not perform this assessment for the regulated conventional pollutants, namely BOD_5 and TSS, since the conventional pollutants are generally not regulated under PSES and PSNS. For the proposal, EPA evaluated the seven nonconventional and toxic pollutants proposed for regulation under BAT for the Non-Hazardous subcategory, and concluded that ammonia removals were greater at the BAT facilities. Following the proposal, EPA reviewed the data used for the BAT percent removal calculations. In the proposal, EPA calculated the BAT percent removals using data from well-operated biological treatment facilities in EPA's database. However, some of these facilities did not pass the editing criteria for selection as a BPT/BAT facility. In the revised analysis, EPA calculated percent removals using data from only those seven facilities that passed the BPT/BAT editing criteria. In addition, in the proposal, EPA inadvertently failed to use selected BAT facilities in the calculation of percent removals for several pollutants even though the data that met the editing criteria for the facility were available. As a result of this review, the BAT facility removals for the analysis have changed for the Non-Hazardous subcategory since the proposal. Finally, after proposal, EPA decided not to set BPT limits for toluene. Therefore, this pollutant is not considered in the analysis, see Section 7.6.1.

In determining BAT percent removals, EPA used data from selected BAT facilities only if they met the following criteria:

1) The influent concentration for a particular pollutant was greater than 10xMDL,

2) The facility had demonstrated removal of the pollutant (EPA did not use facilities showing zero or negative percent removal), and

3) The facility did not employ treatment technologies in addition to the selected BAT that may contribute to further reduction of the pollutant.

Applying the editing criteria outlined above to those facilities selected as BAT resulted in a different set of facilities being used in the calculation of the percent removals than in proposal for each of the pollutants to be regulated. Table 7-5 lists the BAT facilities used in the calculation of percent removals for the non-hazardous regulated pollutants.

The Agency used EPA sampling episode data, Detailed Questionnaire Section C data and Detailed Monitoring Questionnaire data to calculate the non-hazardous BAT facility percent removals. However, if a particular facility had applicable Detailed Questionnaire Section C and Detailed Monitoring Questionnaire data, EPA used only the Detailed Monitoring Questionnaire data in calculating the BAT percent removals because of a potential overlap of the concentration data submitted for these two questionnaires. EPA used only data with matching influent and effluent data points. The Agency calculated a percent removal for each data source, and then determined an overall median percent removal for each regulated pollutant. Table 7-5 presents the summary of BAT performance data used in calculating the percent removals for the Non-Hazardous subcategory. Table 7-6 presents the results of the removal comparison for the Non-Hazardous subcategory. This table shows the median BAT percent removal and the median POTW percent removal. Although the removal comparison suggests that, at the time of proposal, only ammonia would pass through, as a result of further review of the applicable data contained in the Public Record, the comparison for the final rule suggests that three other pollutants (benzoic acid, p-cresol, and phenol) would pass through in the Non-Hazardous subcategory. However, for the reasons discussed in Chapter 11, EPA is not establishing pretreatment limits for any pollutant in the Non-Hazardous subcategory because it concluded the pollutants which might pass through were, in fact, in most cases susceptible to treatment and that national regulation was not required.

7.7.3 Hazardous Subcategory Pollutants to be Regulated for Indirect Dischargers

EPA conducted removal comparisons for the priority and nonconventional pollutants regulated under BAT for hazardous landfills. EPA did not perform the analysis for the regulated conventional pollutants, namely BOD_5 and TSS, since the conventional pollutants are generally not regulated under PSES and PSNS. For the proposal, EPA performed the analysis on the thirteen nonconventional and toxic pollutants proposed for regulation under BAT for the Hazardous subcategory and determined that seven pollutants appeared to pass through. EPA proposed pretreatment standards for the following six of these pollutants: ammonia as nitrogen, benzoic acid, toluene, alpha terpineol, p-cresol, and aniline. For the proposed rule, EPA used both of the BAT facilities in the calculation of percent removals. However, upon review of the data editing procedures, EPA determined that some of the facility data should not have been used in the calculation of percent removals. As a result of this review, the BAT facility removals for the removal comparison have changed for the Hazardous subcategory since the proposal. Finally, after proposal, EPA decided not to set BPT limits for toluene and benzene; therefore, these pollutants are not considered in the comparison (see Section 7.6.2).

In determining BAT percent removals, EPA used data from selected BAT facilities only if they met the following criteria:

1) The influent concentration for a particular pollutant was greater than 10xMDL,

2) The facility had demonstrated removal of the pollutant (EPA did not use facilities showing zero or negative percent removal), and

3) The facility did not employ treatment technologies in addition to the selected BAT that may contribute to further reduction of the pollutant.

Applying the editing criteria outlined above to those facilities selected as BAT resulted in a different set of facilities being used in the calculation of the percent removals for each of the pollutants to be regulated. Table 7-7 lists the BAT facilities used in the calculation of percent removals for the hazardous regulated pollutants.

The Agency used EPA sampling episode data Detailed Questionnaire Section C data and Detailed Monitoring Questionnaire data to calculate the hazardous BAT facility percent removals. However, if a particular facility had applicable Detailed Questionnaire Section C and Detailed Monitoring Questionnaire data, EPA used only the Detailed Monitoring Questionnaire data in calculating the BAT percent removals because of a potential overlap of the concentration data submitted for these two questionnaires. EPA used only data with matching influent and effluent data points. The Agency calculated a percent removal for each data source, and then determined an overall median percent removal for each regulated pollutant. Table 7-7 presents the summary of BAT performance data used in calculating the percent removals for the Hazardous subcategory. Table 7-8 presents the results of the removal comparison for the Hazardous subcategory. This table shows the median BAT percent removal and the median POTW percent removal. At the time of proposal, the removal comparison suggested better removals at BAT facilities than at POTWs for seven pollutants (ammonia, alpha terpineol, aniline, benzoic acid, p-cresol, phenol, and toluene). As a result of EPA's assessment, the comparison now suggests greater BAT removals for the following eight pollutants: ammonia, alpha terpineol, aniline, benzoic acid, naphthalene, p-cresol, phenol, and pyridine. However, for the reasons discussed in Chapter 11, EPA is not establishing pretreatment limits for any pollutant in the Hazardous subcategory.

Table 7-1: Non-Hazardous Subcategory Pollutants of Interest

Non-Hazardous Pollutant of Interest	Cas #	Subtitle D Municipal Pollutant of Interest	Subtitle D Non-Municipal Pollutant of Interest
Conventional			
BOD	C-002	X	X
TSS	C-009	X	X
Nonconventional			
Ammonia as Nitrogen	7664417	X	X
COD	C-004	X	X
Nitrate/Nitrite	C-005	X	X
TDS	C-010	X	X
TOC	C-012	X	X
Total Phenols	C-020	X	X
Organic			
1,4-Dioxane	123911	X	
2-Butanone	78933	X	
2-Propanone	67641	X	
4-Methyl-2-Pentanone	108101	X	
Alpha Terpineol	98555	X	
Benzoic Acid	65850	X	
Hexanoic Acid	142621	X	
Methylene Chloride	75092	X	
N,N-Dimethylformamide	68122	X	
O-Cresol	95487	X	
P-Cresol	106445	X	
Phenol	108952	X	
Toluene	108883	X	
Tripropyleneglycol Methyl Ether	20324338	X	
Metals			
Barium	7440393	X	
Chromium	7440473	X	
Hexavalent Chromium	18540299	X	
Strontium	7440246	X	X
Titanium	7440326	X	
Zinc	7440666	X	
Pesticides/Herbicides			
Dichloroprop	120365	X	
Disulfoton	298044	X	
Dioxins/Furans			
1234678-HpCDD	35822469	X	
OCDD	3268879	X	

Table 7-2: Hazardous Subcategory Pollutants of Interest

Pollutant of Interest	Cas #	Pollutant of Interest	Cas #
Conventional		**Organics (cont.)**	
BOD	C-002	P-Cresol	106445
Hexane Extractable Material	C-036	Toluene	108883
TSS	C-009	Trans-1,2-Dichloroethene	156605
Nonconventional		Trichloroethene	79016
Amenable Cyanide	C-025	Tripropyleneglycol Methyl Ether	20324338
Ammonia as Nitrogen	7664417	Vinyl Chloride	75014
COD	C-004	**Metals**	
Nitrate/Nitrite	C-005	Arsenic	7440382
TDS	C-010	Chromium	7440473
TOC	C-012	Copper	7440508
Total Phenols	C-020	Lithium	7439932
Organics		Molybdenum	7439987
1,1-Dichloroethane	75343	Nickel	7440020
1,4-Dioxane	123911	Selenium	7782492
2,4-Dimethylphenol	105679	Strontium	7440246
2-Butanone	78933	Tin	7440315
2-Propanone	67641	Titanium	7440326
4-Methyl-2-Pentanone	108101	Total Cyanide	57125
Alpha Terpineol	98555	Zinc	7440666
Aniline	62533	**Pesticides/Herbicides**	
Benzene	71432	2,4,5-TP	93721
Benzoic Acid	65850	2,4-D	94757
Benzyl Alcohol	100516	2,4-DB	94826
Diethyl Ether	60297	Dicamba	1918009
Ethylbenzene	100414	Dichloroprop	120365
Hexanoic Acid	142621	MCPA	94746
Isobutyl Alcohol	78831	MCPP	7085190
Methylene Chloride	75092	Picloram	1918021
M-Xylene	108383	Terbuthylazine	5915413
Naphthalene	91203	**Dioxins/Furans**	
O+P Xylene	136777612	1234678-HpCDD	35822469
O-Cresol	95487	1234678-HpCDF	67562394
Phenol	108952	OCDD	3268879
Pyridine	110861	OCDF	39001020

Table 7-3: Non-Hazardous Subcategory - POTW Percent Removals

Pollutant	MDL (ug/L)	Median % Removal	POTW Percent Removal Source
Ammonia as Nitrogen	10	39	50 POTW 10xMDL
Alpha-Terpineol	10	95	NRMRL 10xMDL - Industrial
Benzoic Acid	50	81	NRMRL 10xMDL - Industrial
P-Cresol	10	68	NRMRL 10xMDL - Domestic & Industrial Sources
Phenol	10	95	50 POTW 10xMDL
Zinc	20	81	50 POTW 10xMDL

Table 7-4: Hazardous Subcategory - POTW Percent Removals

Pollutant	MDL (ug/L)	Median % Removal	POTW Percent Removal Source
Ammonia as Nitrogen	10	39	50 POTW 10xMDL
Alpha-Terpineol	10	95	NRMRL 10xMDL - Industrial
Aniline	10	98	NRMRL 10xMDL - Industrial
Benzoic Acid	50	81	NRMRL 10xMDL - Industrial
Napthalene	10	95	50 POTW 10xMDL
Phenol	10	95	50 POTW 10xMDL
Pyridine	10	95	NRMRL 10xMDL - Industrial
P-Cresol	10	75	NRMRL 10xMDL - Domestic & Industrial Sources
Arsenic	10	66	50 POTW >20 ppb
Chromium	10	82	50 POTW 10xMDL
Zinc	20	81	50 POTW 10xMDL

Table 7-5: Non-Hazardous Subcategory - BAT Performance Data

Pollutants of Interest	Facility /Episode	Avg Inf	Avg Eff	% Removal
Ammonia	16041 (DMQ)	679	5.39	99.21
	16041 (ANL)	475	1.4	99.71
	16122 (ANL)	181	1.14	99.37
	16132 (DMQ)	206	5.9	97.14
				99.29 Median
Alpha Terpineol	16041 (ANL)	653	10	98.47
	16122 (ANL)	123	10	91.87
				95.17 Median
Benzoic Acid	16041 (ANL)	15400	50	99.68
	16122 (ANL)	9300	50	99.46
				99.57 Median
P-Cresol	16041 (ANL)	1360	10	**99.26 Median**
Phenol	16041 (ANL)	5120	10	99.80
	16118 (DET)	350	10	97.14
	16122 (ANL)	395	10	97.47
				97.47 Median
Zinc	16041 (DMQ)	505	214	57.62
	16041 (ANL)	310	87	71.94
	16132 (DMQ)	490	50	89.80
				71.94 Median

All units in ug/L, except ammonia in mg/L.
ANL: EPA sampling episode data
DMQ: Detailed Monitoring Questionnaire data
DET: Detailed Questionnaire data

Table 7-6: Pass-Through Analysis for the Non-Hazardous Subcategory

Pollutant	Average BAT Percent Removal	Average POTW Percent Removal
Ammonia	99%	39%
Alpha Terpineol	95%	95%
Benzoic Acid	99%	81%
P-Cresol	99%	68%
Phenol	97%	95%
Zinc	72%	81%

Table 7-7: Hazardous Subcategory - BAT Performance Data

Pollutants of Interest	Facility /Episode	Avg Inf	Avg Eff	% Removal
Ammonia	16041 (DMQ)	679	5.39	99.21
	16041 (ANL)	475	1.4	99.71
	16122 (ANL)	181	1.14	99.37
	16132 (DMQ)	206	5.9	97.14
				99.29 Median
Alpha-Terpineol	16041 (ANL)	653	10	**98.47 Median**
Aniline	16041 (ANL)	1060	10	99.06
	16087 (ANL)	533	10	98.12
				98.59 Median
Benzoic Acid	16041 (ANL)	15400	50	99.68
	16087 (ANL)	64957	50	99.92
				99.80 Median
Naphthalene	16041 (ANL)	645	10	**98.45 Median**
P-Cresol	16041 (ANL)	1360	10	99.26
	16087 (ANL)	5022	10	99.80
				99.53 Median
Phenol	16041 (ANL)	5120	10	99.80
	16087 (DET)	98500	814	99.17
	16087 (ANL)	65417	31	99.95
				99.80 Median
Pyridine	16087 (ANL)	301	10	**96.68 Median**
Arsenic	16087 (DMQ)	1400	325	76.79
	16087 (ANL)	584	308	47.26
				62.02 Median
Chromium	16041 (DET)	210	120	42.86
	16087 (DMQ)	730	312	57.26
	16087 (ANL)	415	82	80.24
				57.26 Median
Zinc	16041 (DMQ)	505	214	57.62
	16041 (ANL)	310	87	71.94
	16087 (DMQ)	550	380	30.91
				57.62 Median

All units in ug/L, except ammonia in mg/L.
ANL: EPA sampling episode data
DMQ: Detailed Monitoring Questionnaire data
DET: Detailed Questionnaire data

Table 7-8: Pass-Through Analysis for the Hazardous Subcategory

Pollutant	Average BAT Percent Removal	Average POTW Percent Removal
Ammonia	99%	39%
Alpha Terpineol	98%	95%
Aniline	99%	98%
Benzoic Acid	99%	81%
Naphthalene	98%	95%
P-Cresol	99%	68%
Phenol	99%	95%
Pyridine	97%	95%
Arsenic	62%	66%
Chromium	57%	82%
Zinc	58%	81%

Figure 7-1: Development of Pollutants of Interest

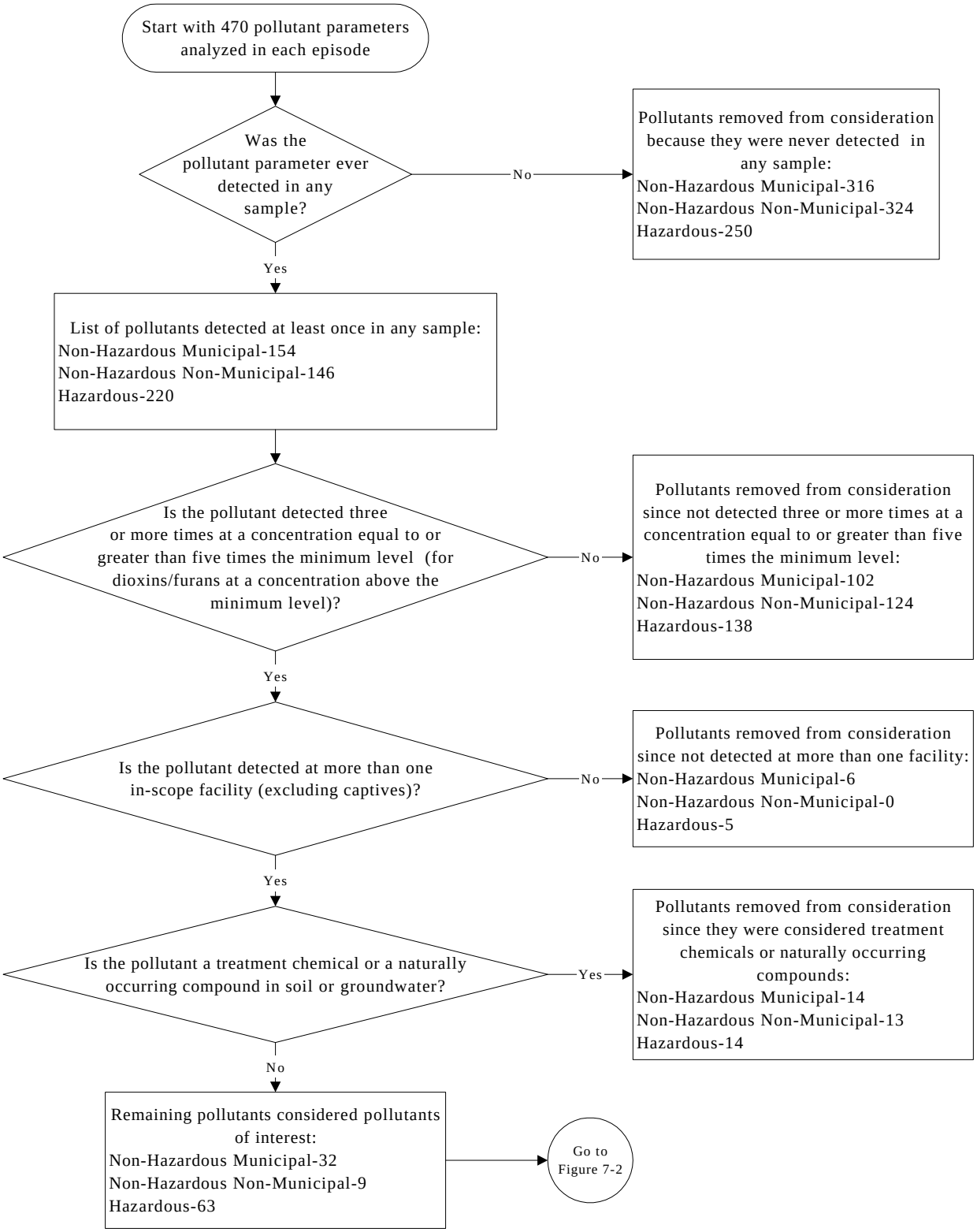

Figure 7-2: Selection of Pollutants to be Regulated